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This magazine is published to promote sound thought concerning industrial medicine and the surgery of trauma. To that end it will contain articles, news items, reports, digests, and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited. The editors will exercise care in checking on the accuracy of data printed but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same in the current or any subsequent issues as they may be inclined.

Volume 21 NOVEMBER 1952 *Number 11*

1953 INDUSTRIAL HEALTH CONFERENCE
Los Angeles, California—April 18 to 25, 1953

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INDUSTRIAL MEDICINE AND SURGERY, The Journal of Medicine in Industry: Entered as second class mail matter August 28, 1941, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879. Reentered, October 3, 1949. Additional entry at Sheboygan, Wisconsin. Published on the fifth of each month by INDUSTRIAL MEDICINE PUBLISHING COMPANY, Chicago (publishers also of AMERICAN INDUSTRIAL HYGIENE ASSOCIATION QUARTERLY). STEPHEN G. HALOS, President; A. D. CLOUD, Publisher; CAREY P. McCORD, M.D., Editor; DORIS FLOURNOY, Editorial Assistant; HAROLD A. HOOPER, Treasurer; STEPHEN G. HALOS, Advertising and Business Manager. Member, Audit Bureau of Circulations. PUBLICATION, EDITORIAL and EXECUTIVE OFFICES, 605 North Michigan Avenue, Chicago 11, Illinois. Subscription $6.00 per year in the United States; $6.50 (U.S. Currency) per year in Canada; $7.00 (U.S. Currency) per year in other countries. Single copies 75 cents. Title Registered in United States Patent Office. Rd. Canada, 1942.

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SEWARD E. MILLER, Medical Director, Chief, Division of Occupational Health, U.S. Public Health Service, has accepted a five-year appointment as a special consultant on the joint WHO-ILO Expert Advisory Panel on Social and Occupational Health. As his first assignment, WHO has asked DR. MILLER to participate, as an expert consultant on occupational health, in a Regional European seminar on that subject to be held in Leyden, Netherlands, November 30-December 9, 1952, jointly sponsored by the WHO and ILO. About 50 participants from various European countries have been invited to attend, together with some 15 consultant lecturers who will conduct the seminar. DR. MILLER is presenting a 6,000 word paper on "The Organization of Occupational Health Programs in Small Plants," covering particularly the coordination of in-plant occupational health services with community public health programs, the growth of union health centers, and the various techniques for developing in-plant health services in small plants, found in this country.

GEORGE F. WILKINS, M.D., Medical Director, New England Telephone and Telegraph Company, and President-elect of the Industrial Medical Association, on September 23 delivered the first lecture in a 10-weeks' course given at Boston University by the College of Business Administration, to explore the psychological, communal and economic problems resulting from alcoholism. DR. WILKINS' topic was "Problem Drinkers in Industry and Business."

BACK IN Cincinnati after an emergency summons to Panama to help a group of Panamanian laborers suffering from tetraethyl lead poisoning, DR. CARL V. KITZMILLER is preparing a report on the victims' recovery through the use of new drugs. DR. KITZMILLER, Associate Professor of Industrial Medicine at the Graduate School of Industrial Health, Kettering Laboratory, University of Cincinnati, spent three weeks in Panama commuting between three clinics and hospitals in which 25 men were confined. He

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took with him a quantity of two new drugs, British anti-Lewisite (BAL) and versene, which he used in treating the men. They had contracted the poison while cleaning aviation gasoline tanks. Two workmen had died before local doctors contacted the Esso Standard Oil Company in Panama and its representatives put in a call to Kettering Laboratory. DR. KITZMILLER also is Associate Medical Director of the Ethyl Corporation of New York City. The report is being made for Kettering Laboratory.

—*Cincinnati Times Star*, September 6, 1952.

B. MARR LANMAN, M.D., has been appointed Assistant to the Medical Director of Schenley Laboratories, of which DR. CHARLES E. DUTCHESS is Vice-President and Medical Director. DR. LANMAN, a native of Indiana, graduated from Cornell University in 1941 and received his medical degree from Jefferson Medical College, Philadelphia, in 1944. He served two years in the U.S. Army Medical Corps and was discharged in 1947 as a captain. He was formerly on the staffs of Bellevue Hospital and Presbyterian Hospital, both in New York City. He will make his headquarters at Schenley Laboratories' New York offices in the Empire State Building.

CARL T. OLSON, M.D., and KENNETH C. PEACOCK, M.D., were on the program of the Personnel Conference of the American Management Association in New York October 1, 1952. DR. OLSON talked on "Maintenance of Health In the Elderly Work Force," and DR. PEACOCK on "The Dollar Value of Medical Care for Small Industrial Units." DR. OLSON will represent the INDUSTRIAL MEDICAL ASSOCIATION at the annual meeting of the International Association of Accident Boards and Commissions at Miami Beach, Florida, November 16-20.

THE SECOND Annual Conference on Occupational Vision is being called by Rutgers University, the State University of New Jersey, for the purpose of continuing the work of promoting conservation of vision, protection of eyes against injury, and aiding in increasing the efficiency, health, and welfare of industrial workers; and it will be held at the Hotel Dennis, Atlantic City.

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*Kuhn, H.S.: Tr. Am. Acad. Ophth., p. 432. (March-April) 1951.

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New Jersey, November 13 and 14, 1952. On the first day there will be a forum on "Visual Efficiency and Production" in the morning, and in the afternoon a forum on "Eye Safety" and a concurrent session on "Conservation of Vision." On Friday the subject of the morning session will be "Aids for Better Seeing," and in the afternoon the subjects discussed will be those involved in the "Economic Aspects of Occupational Vision."

FRANCIS C. DOHAN, M.D., Assistant Professor of Clinical Medicine, University of Pennsylvania since 1947, was recently appointed Medical Director of RCA Victor Division, Radio Corporation of America, Camden, New Jersey. He will continue his research and teaching activities and limited private practice.

INDUSTRIAL HYGIENE FOUNDATION'S Seventeenth Annual Meeting and Conferences will be held at Mellon Institute, Pittsburgh, on November 19 and 20, 1952. The four professional conferences—Medical, Chemical, Engineering, and Legal—will occupy the first day, and the general (management) meeting will be held on the second day.

JOHN ALLEN, M.D., has recently assumed the medical directorship for the Oscar Mayer Corporation in Madison, Wisconsin.

THE 40th National Safety Congress and Exposition was held in Chicago October 20-24. Featured were a panel discussion on "How Hernias Occur and Their Relation to Occupation and Treatment," led by DR. KOZME F.

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REFERENCES:

1. Gastric Tolerance for Aspirin and Buffered Aspirin. Ind. Med. 20:480, Oct. 1951.
2. Effect of Buffering Agents on Absorption of Acetylsalicylic Acid. J. Am. Pharm. Assoc., Sc. Ed. 39:21, Jan. 1950.

BUFFERIN is Better Tolerated than Aspirin.[1]

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KAPOV, with DRS. BURTON C. KILBOURNE and JOHN C. TROXEL, of Chicago, participating; and a panel discussion on "The Impact of Temporary Disability on Industry," led by DR. THEODORE R. VAN DELLEN, Chicago, with DR. ARTHUR K. PETERSON, Chicago, one of the collaborators. Among others participating were: LAWRENCE JONES, Los Angeles, "Cause, Treatment, and Prevention of Low Back Pain"; HAROLD BRANDALEONE, New York, "Medical Aspects of Accident Prevention"; EDITH LIND KRISTELLER, New York, "A Home for the Handicapped — An Example of Human Engineering"; RUSSELL B. ROBSON, Windsor, Ontario, Canada, "Conditioning for Retirement"; CHARLES F. SHOOK, Toledo, Ohio, "Just People"; GEORGE H. GEHRMANN, Wilmington, Delaware, "New Approach to Safety"; HEDWIG S. KUHN, Hammond, Indiana, "The Eyes Have It"; JOHN W. G. HANNON, Washington, Pennsylvania, "Practical Aspects of Pulmonary Function"; ARCHER S. GORDON, Chicago, "Critical Survey of Manual Artificial Respiration."

THE Institute of Industrial Health of the University of Cincinnati will accept applications for a limited number of Fellowships offered to qualified candidates who wish to pursue a graduate course of instruction in preparation for the practice of Industrial Medicine. Any registered physician, who is a graduate of a Class A medical school and who has completed satisfactorily at least two years of training in a hospital accredited by the American Medical Association may apply for a Fellowship in the Institute of Industrial Health. (Service in the Armed Forces or private practice may be substituted for one year of training.) The course of instruction consists of a two-year period of intensive training in Industrial Medicine, followed by one year of practical experience under adequate supervision in industry. Candidates who complete satisfactorily the course of study will be awarded the degree of Doctor of Industrial Medicine.

THE FOURTH Occupational Health Discussional at Ann Arbor will be given December 12 and 13, 1952, by the School of Public Health of the University of Michigan, in collaboration with the Institute of Industrial Health. The theme this year is "The Worker as a Member of the Industrial Health Team," and the program is built around the idea that industrial health is more effectively practiced "with the worker than at him." There will be four sessions. DR. EARL F. LUTZ will be moderator and recorder of the morning session on the first day. DR. CLARENCE D. SELBY will talk on "Occupational Health Appraises Its Future." DR. ADOLPH G. KAMMER will discuss "The Medical Analysis of the Industrial Health Team," and WILLIAM BRADLEY "The Industrial Hygiene Analysis of the Health Team." These presentations will be followed by a general discussion, with DR. CAREY P. MCCORD as leader. In the afternoon RALPH SMITH will act as moderator and recorder, and the session will hear from DR. GRADIE ROWNTREE and DON IRISH on the topic "The Industrial Health Team Completes Itself." DR. ROWNTREE'S title will be "The Ultimate Consumer of Occupational Health," and MR. IRISH will describe how "The Industrial Worker Joins the Team." In the evening DR. OTTO TOD MALLERY, JR., will be toastmaster and recorder at a dinner at the Michigan Union. On the topic "The Full Industrial Health Team Takes Off," DR. WILLIAM G. FREDRICK will view its progress "Through the Eyes of the Industrial Hygienist," and DR. J. F. MCCAHAN "Through the Eyes of the Industrial Physician." The Saturday morning session will study "Immediate Tasks for the Team—The New for 1953." DR. JOSEPH T. NOE will speak for the industrial physician; HENRY FIELD SMYTH for the industrial hygienist; DR. EDWARD R. ASTON for the industrial dentist; MISS MYRTLE MONTGOMERY for the industrial nurse, and GERALD PHELAN for the industrial safety director. The first of these "Discussionals," conducted by the School of Public Health, on "Industrial Health Programs," October 27-28, 1950, was reported in *Industrial Medicine and Surgery*, 19:12, 581 (December) 1950; the second, "Medical Personal Relations in Industry," conducted May 17-19, 1951, was reported in the same Journal, 21:1, 28 (January) 1952; and the third, conducted March 26, 1952, was summarized in the report, "Current Programs in Industrial Medicine," in *Industrial Medicine and Surgery*, 21:10, 496 (October) 1952.

THIS MONTH

IN THE picture on page 548, captioned "Busman's Holiday," it is DR. MEREWETHER, Senior Medical Inspector of Factories, Ministry of Labour and National Service, London, who, in the foreground, is studying the scientific displays in a corner of the Saranac Laboratory. We hope no one will make an international incident out of the caption; it does not imply that we have called the distinguished doctor a "busman".... IN THE editorial, "The Back Door Sneak" (page 560) regarding the attempted introduction of socialized medicine into the United States by treaty, the World Medical Association is quoted: "The only document given the delegates on the medical aspects of social security was one prepared by a World Health Organization committee on which there was not a single practicing physician." The appointment of DR. SEWARD MILLER (page 6) is an assurance that the direct approach from now on will have a forceful advocate.... FOUR YEARS ago American Brake Shoe Company put its mobile x-ray unit on the road to visit all of its 56 plants. This completed, after 50,000 miles, the technician reports finding 168 previously undetected cases of tuberculosis, and 13 early chest malignancies. Equally important, the remainder of the 10,000 employees have a measure of assurance regarding their health.... PRE-ELECTION note: Regardless of the result, it should be remembered that "the President is there in the White House for you—it is not you who are here for him; the Secretaries act in their bureaus for you—not you here for them; the Congress convenes every Twelfth-month for you; laws, courts, the forming of States, the charters of cities, the going and coming of commerce and mails, are all for you." Walt Whitman said it. It is up to us to *mean* it.

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64 cases

in surgery of the head, neck and extremities[1,2]
Postoperatively 35 patients required no narcotics, another 24 required only 1 or 2 doses; no patient required more than 4 doses.

187 cases

in thoracic and upper abdominal surgery and chest pain[1,2,3,4]
Postoperative intercostal nerve block with Efocaine allowed patients to breathe deeply and cough freely without pain, obviated the need for respiration-depressing narcotics—"an effective means of preventing postoperative pulmonary complications."[4] "... more than 50 blocks for miscellaneous chest pain ... were all successful."[4]

346 cases

in lower abdominal surgery[1,2]
Convalescence was pleasanter and early ambulation was facilitated with Efocaine. In one group of 285 patients, 87 required no postoperative narcotics, and 141 needed only 1 or 2 doses.[2]

246 cases

in anorectal and vaginal surgery, pruritus ani[1,2,5,6]
"A dramatic relief of postoperative pain ... in almost every instance ... postoperative narcotic requirements were virtually eliminated."[5]
"All of the patients with pruritus ani were benefited by ... Efocaine."[6]

45 cases

following tonsillectomy[7]
"The results ... were most dramatic. A high degree of local pain control was achieved in every instance."

94 cases

after episiotomy[8]
"A high degree of episiotomy pain-relief was obtained ... patient morbidity was greatly reduced, and a more pleasant convalescence achieved."

25 cases

in minor and office surgery[1]
Relief of postoperative pain was excellent in 76% of the group, good in the remaining 24%.

Clinical experience with EFOCAINE in over 1,000 patients is now recorded in the medical literature. This experience, summarized above, demonstrates unequivocally that EFOCAINE achieves at last a long-sought goal in medicine and surgery: *prolonged, non-narcotic pain control.*

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1. Ansbro, F. P., and others: Anesthesiology *13*:306, 1952. 2. Iason, A. H., and Shaftel, H. E.: Postoperative Pain Control, presented before the Section on Anesthesiology of the American Medical Association, Chicago, Ill., June 10, 1952. 3. Deaton, W. R., Jr., and Bradshaw, H. H.: Am. Surgeon *18*:616, 1952. 4. Puderbach, W. J., and others: Journal Lancet *72*:203, 1952. 5. Tucker, C. C.: J. Kansas M. Soc. *53*:230, 1952. 6. Gross, J. M., and others: New York State J. Med. *52*:1413 (June 1) 1952. 7 Penn, S. E.: Arch. Otolaryng. *56*:59, 1952. 8. Cappe, B. E., and Pallin, I. M.: Am Pract & Digest Treat *3*:739, 1952.

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Industrial Medical and Related Chronology selected and arranged by ROBERT T. LEGGE, M.D., F.A.C.S., Berkeley, California

"O great corrector of enormous times,
Shaker of o'er-rank states, thou grand decider
Of dusty and old titles, that healest with blood
The earth when it is sick, and curest the world
O' the pleurisy of people!"
—Beaumont and Fletcher

♏ = Scorpio — October 23-November 22 | ♐ = Sagittarius — November 23-December 21

1952 NOVEMBER

NOVEMBER

OWL on a black branch,
Moon a silver plate,
Little, brittle last leaf
Arguing with Fate!

Lonely poplar sentry
At the pasture bars;
Meadows shadows' bivouac,
Field rows summer's scars!

Crackle of the hoarfrost,
Stealthy-footed, chill;
Old and cold the arbor,
Bleak and cold the hill!

Lure of lighted windows,
Warmth of tavern's cheer;
Strong the song of plenty,
Brown the ale, and clear!

Gone the tree-leaf rainbow
With the singing birds—
Sheen of green a covenant
In red and golden words!

Gone the month of reaping,
Tale of seasons told—
Glowing growing springtime
Yielding autumn old!

Cycle of the full bin—
Tree and vine and grain,
From toil and soil together
To soil and toil again!

Symbol of th' eternal
—Sow that ye may reap:
Earth and birth and harvest moon
Yearly trystings keep!

☽ 1st Quar. ○ Full Moon ☾ 4th Quar. ● New Moon

1 ♏ ○ Sa
1875—Henry Field Smyth, of Pocasset, Massachusetts, born at Philadelphia. Professor of Industrial Hygiene Emeritus, University of Pennsylvania. Distinguished toxicologist and researcher in industrial diseases.
"It is part of the cure to wish to be cured"—Seneca

2 ♏ S
1876—Charles Singer born at Camberwall. Professor of the History of Medicine Emeritus at University of London. England's foremost medical historian.
"Industrial medicine is taught in the school, but it is learned in the plant"—Mallery

3 ♏ M
1915—George M. Sternberg, hygienist, epidemiologist and surgeon general of the U.S. Army died at Washington, D.C., age 77 years.
1840—Christian Fenger birthday. The first teacher of pathology at Chicago. Noted pioneer surgeon.

4 ♏ Tu
1911—William Seaman Bainbridge, 1870-1947, a New York surgeon, published "The Evolution of the Operating Table."
"The industrial nurse should never be a diagnostician; she should always be a suspectician"—McNeil

5 ♏ W
1714—Bernardino Ramazzini, the father of industrial hygiene, Professor of Physics at Padua University, author of "De Morbis Artificum," died.
"A good work-environment is a good-work environment" —Cook

6 ♏ Th
1865—William Leishman born at Glasgow. Became Director-General British Army Medical School. Distinguished British investigator in tropical medicine; discoverer of the Leishman-Donovan body which causes Kalazar, also the Leishman stain.

7 ♏ Fr
1867—Madame Marie Curie born in Warszawa. In 1895 she married Pierre Curie, instructor of physics. This couple worked four years in extracting from pitchblende the radioactive substance, discovering radium. The beginning of a new field of science: Radiology.

8 ♏ Sa
1824—The Medical College of South Carolina began its first courses at Charleston.
1895—The X-ray discovered by Wilhelm Conrad Roentgen, a German. One of the most dramatic events in the history of science; it created the specialty of Roentgenology.

9 ☾ S
1871—Florence Rena Sabin born at Central City, Colorado. Professor of Histology, noted for her researches and contributions in tuberculosis, in 1945 was awarded the Trudeau Medal by the National Tuberculosis Association.
"Industry doesn't hire disabilities; it hires skills"—Burnell

10 ♏ M
1950—The Welcome Medal of the Association of Military Surgeons of U.S. awarded to Herman T. Chinn, chief of School of Aviation at New York City for his studies of motion sickness.
"Old age hath yet his honor, and his toil"—Tennyson

11 ♏ Tu
1771—Ephraim McDowell born in Rockville County, Virginia, the Father of Ovariatomy. He operated successfully at Danville, Kentucky, on Mary Crawford.
1864—In a Ohio village Dr. G. W. Crile was born. One of America's greatest surgeons and medical scientists.

12 ♏ W
1877—Frederic Fenger born in Copenhagen, Denmark, a nephew of Christian Fenger, the renowned Chicago surgeon. Distinguished endocrinologist, head of the Armour Research Laboratory of organo-therapeutics.
"... The blessed faculty of forgetting"—Osler

13 ♏ Th
1913—First Convocation of the American College of Surgeons was held in the Congress Hotel at Chicago, J. M. T. Finney, of Baltimore, was President.
"The secret of ugliness consists not in irregularity, but in being uninteresting"—Emerson

14 ♏ Fr
1797—Sir Charles Lyell born at Forfarshire, Scotland. Became Professor at Kings College; celebrated British geologist; author "Principles of Geology," and the "Antiquity of Man."
1888—The Pasteur Institute in Paris was officially opened.

15 ♏ Sa
1935—The Industrial Hygiene Foundation was organized and convened at the Mellon Institute in Pittsburgh, Pennsylvania.
"Prevention is not only better than cure; it is also cheaper than cure"—Winslow

16 ♏ S
1753—James McHenry born in Ballymena, Ireland. A Revolutionary army surgeon. Secretary of War in Washington's and Adams' cabinet. Fort McHenry named after him. Here Frances Scott Key, prisoner on a British ship, wrote "The Star Spangled Banner."

17 ● M
1786—William Paul C. Barton born at Philadelphia. Chief of the Bureau of Medicine, 1842, U.S. Navy.
"It does not take a great mind to make simple things complicated, but a very great mind to make complicated things simple"—Charburough

18 ♏ Tu
1810—Asa Gray, M.D., born in Paris, New York. America's greatest botanist; Professor at Harvard; author of many contributions and textbooks on botany.
"Work is the inevitable condition of human life, the true source of human welfare"—Tolstoi

19 ♏ W
1914—Charles Sedgwick Minot, distinguished embryologist and biologist, a Professor of Embryology at Harvard, published the result of 10 years' labor—his well-known book "Human Embryology."
"Silence is a powerful weapon"—Osler

20 ♏ Th
1907—Sir Thomas Oliver, M.D., F.R.C.P., Professor at Durham University, New Castle upon Tyne, wrote his famous book "Diseases of Occupation."
"Laughter is not a bad beginning for a friendship, and it is the best ending for one"—Wilde

21 ♏ Fr
1929—Victor Clarence Vaughn died this day. American medicine and public health lost a great leader. He was an excellent teacher, a scientist, and epidemiologist for 56 years at the University of Michigan.
"Self-trust is the essence of heroism"—Emerson

22 ♏ Sa
1884—Joseph Louis Ransohoff, 1853-1921, Cincinnati surgeon, first performed gastroenterostomy.
"The penalty that people pay for not being interested in politics is to be governed by people worse than themselves"—Plato

23 ♐ S
1902—Major Walter Reed died at Washington, D.C. With his military associates he discovered the carrier of yellow fever. Walter Reed Hospital was named for him.
"If you have to prove what you believe, you have already confessed your doubt"—Burklund

24 ☽ M
1876—Dr. Hidryo Noguchi born in Inawa-shiro, Japan. A distinguished bacteriologist; cultivated for first time artificially the Spirochetes; first to demonstrate treponema pallidum in the brain of paretics; cultivated the bacillus which causes trachoma.

25 ♐ Tu
1720—Richard Mead, M.D., R.S., wrote his short discourse concerning Pestilential Contagion and the methods to be used to prevent it.
"Blessed are they who have nothing to say, and who cannot be persuaded to say it"—Lowell

26 ♐ W
1795—A discourse was delivered by William Linn recommending that the Governor of New York observe a day of Thanksgiving and Prayer on account of the removal of an epidemic fever and for other National Blessings.
"A rare and precious gift, the art of detachment"—Osler

27 ♐ Th
1801—Scientific Dermatology began at the Old Saint Louis Hospital at Paris, with Jean Louis Alsbert.
"The value of a scientific discovery ... cannot be determined by a show of hands among members of a congressional committee"—J.A.D.A.

28 ♐ Fr
1822—Oliver Wendell Holmes, professor of Anatomy, Harvard Medical School, delivered his 36th course of lectures, and for his Farewell Address the subject was "Some of my Early Teachers."
"Forbear to judge, for we are sinners all"—Shakespears

29 ♐ Sa
1926—Sir Thomas Morison Legge, of London, resigned as His Majesty's Factory Inspector after serving 28 years. His contributions to industrial medicine are known throughout the world.
"The Soul is always beautiful"—Whitman

30 ♐ S
1872—John McCrae, distinguished pathologist, and soldier as well as poet, born at Guelph, Canada. Immortalized as the author of "In Flanders Field."
"Life is never so good or so bad as people think"—DeMaupassant

XUM

INDUSTRIAL MEDICINE AND SURGERY
NOVEMBER, 1952

Pneumoconiosis Due to Diatomaceous Earth

CLINICAL AND X-RAY ASPECTS

REGINALD H. SMART, M. D., Clinical Professor of Medicine
University of Southern California, Los Angeles
WALTER M. ANDERSON, M. D., Plant Physician
Johns-Manville Products Corporation, Lompoc, California

UNTIL recently a reasonable doubt has been entertained that diatomaceous earth was capable of producing disabling pneumoconiosis in human workers. In 1935 Beintker[1] concluded that up to that time, serious pneumoconiosis in man due to the inhalation of kieselguhr had not been observed. Actually, three years prior Legge and Rosencrantz[2] had reported x-ray evidence of a rather high incidence (68.5%) of "pneumoconiosis due to silica" among a selected group of Mexican workers exposed to diatomaceous earth. In their paper they classified the x-ray findings under the headings of "Pneumoconiosis: very early; early; moderately advanced; and advanced," but did not define these terms or describe the x-ray appearance of the lesions seen on the chest films. The objective of the survey was to determine whether there was an increased incidence of tuberculosis in these Mexican workers, but no mention of tuberculosis found was made in the final tabulation. No statement was made concerning the incidence of disability, although, of the 118 workers examined, one was recommended for hospital care and five others for "a change of job."

The present investigation was undertaken without benefit of the films made by Legge and Rosencrantz who deserve credit for first calling attention to this problem.

We who later observed the x-rays of men working in this plant, failed to see nodular "silicosis" as designated in the title of Legge and Rosencrantz' paper. However, we did observe the linear pulmonary changes and also the coalescent lesions which will be described later in this paper. It was only upon realizing that the inhalation of diatomaceous earth and its processed products causes a different type of reaction in the lungs than does quartz, that we began to make some progress in the understanding of this disease.

In 1943 Nordmann[3] reported six autopsies on individuals employed in the kieselguhr industry in the Luneburger-Heide deposits in Germany. These men had all been engaged in dusty operations for periods varying from two to 16 years. Typical nodular silicosis was reported in each case. It is probable that the typical silicosis observed by Nordmann was due to the high quartz (30%) content of this particular deposit. On x-ray examination of a number of fullers earth workers, Middleton[4] in 1936 reported only two cases of slight fibrosis. In 1947 Martin[5] and his co-workers examined 32 workers exposed for many years to heavy concentrations of diatomite dust with only three showing mild linear changes. In 1948 Vigliani and Mottura[6] reported "several cases of advanced silicosis among workers employed in the manufacture of filter candles." In their paper the statement is made that "Gardner's opinion given in 1940 that amorphous silica is less silicosis-producing than crystalline silica had contributed largely to the widespread opinion that diatomite dust is not very dangerous to human beings." Gardner's opinion was arrived at after dusting a series of animals with crude diatomaceous earth for a considerable period of time. (At that time he reported having considerable difficulty in maintaining high concentrations of dust in the dusting chambers when the humidity was relatively high.) We wish to reiterate that these observations of Gardner have been verified by our clinical experience. We have observed men exposed only to crude diatomaceous earth (some of them underground) for long periods of time (20 to 25 years) whose chest x-rays have shown only linear changes, and who have no discernible clinical pulmonary disability.

Why then is there this wide difference of

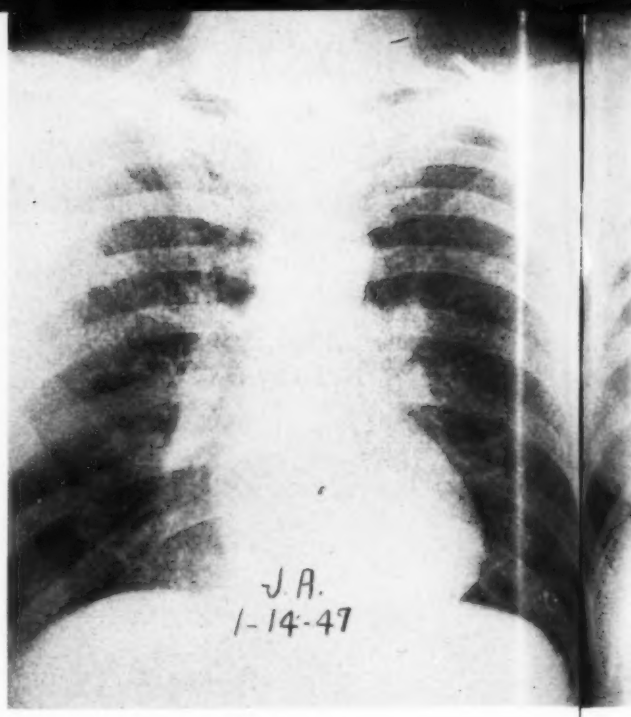
Presented at the Eleventh Annual Meeting of the WESTERN INDUSTRIAL MEDICAL ASSOCIATION, April 26, 1952, Los Angeles.

opinion concerning the toxicity of diatomite? There would seem to be at least two possible explanations for this divergence. The first might be the varying composition of natural diatomite deposits as found the world over. In addition to the possibility of contamination of diatomite earth with other minerals such as quartz, clays, etc., it should be emphasized that diatomite deposits are of two general types. Deposits found on the shores of the seas are known as marine diatomite. Material found on the floors of extinct inland lakes is classified as fresh water diatomite. There seem to be significant differences in the toxicity for humans of these two different varieties of diatomaceous earth, as will be discussed later. The other explanation may lie in the differences in the manufacturing processes of diatomaceous earth products in various parts of the world and at different times. In this industry, significant changes in manufacturing methods have occurred during the past 30 years. Until recently there has been a failure to coordinate the changes and advances made in the manufacturing processes with comprehensive industrial medical studies. These studies should include (1) the mineralogy, petrography, chemistry, x-ray diffraction analyses and particle size distribution of the products involved; (2) exhaustive engineering studies of the industrial operations, working environment and atmosphere; (3) complete medical studies of the workers themselves, including epidemiological surveys correlating work history with x-ray, clinical, and cardiorespiratory function studies of the employees, and also with pathological studies of human tissue; and finally (4), experimental studies on animals with the various diatomaceous earth products.

Industrial Uses and Processes

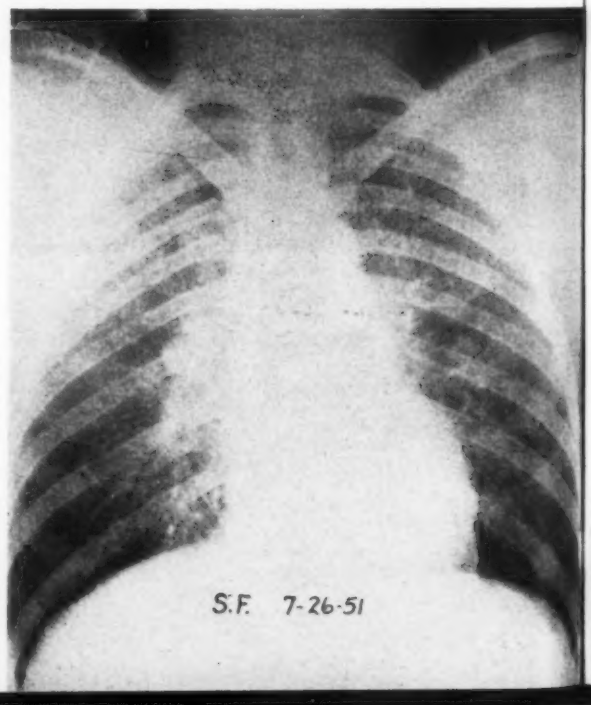
THE diatomaceous earth industry is a comparatively recent one, although diatomaceous earth has been used in various ways since the days of the Roman Empire. In 1870 Nobel invented dynamite which consisted of diatomaceous earth saturated with nitroglycerin. This stimulated the search for diatomaceous earth in Europe, where some rather impure deposits have been worked for the past 60 or 70 years. The largest and best known deposits on this continent are on the Pacific Coast, and have been producing since the turn of the century. Today diatomaceous earth has many uses, some of which are filtering aids, insulation, fillers and extenders, abrasives and polishes, and in ceramics and building materials.

In California, where the American diatomaceous earth industry is chiefly located, it was only after a clinical survey and preliminary animal studies that we began to appreciate the complexity of this problem. In the California industry a majority of workers are exposed to at least three or four qualitatively different types of silica, some of which are apparently quite toxic. Furthermore, there are differences in



Case 1.
White male, age 52 years, worked 16 years in quarries. No symptoms or physical signs. Film shows second degree linear fibrosis.

Case 2.
Mexican male, age 41 years. Worked four years as tunnel kiln helper and piling brick, and 21 years in the laboratory. X-ray unchanged since 1940 and shows third degree linear fibrosis, indefinite nodulation, and hilar enlargement. Tuberculin, coccidioidin and histoplasmin skin tests all positive. Serology for coccidioides negative. Sputa and stomach washes repeatedly negative on culture and animal inoculation. Ventilatory pulmonary function tests only slightly impaired. Patient suffered subacute bacterial endocarditis in 1950 and coronary thrombosis in 1951 from which he has made good recoveries and is now well and working.



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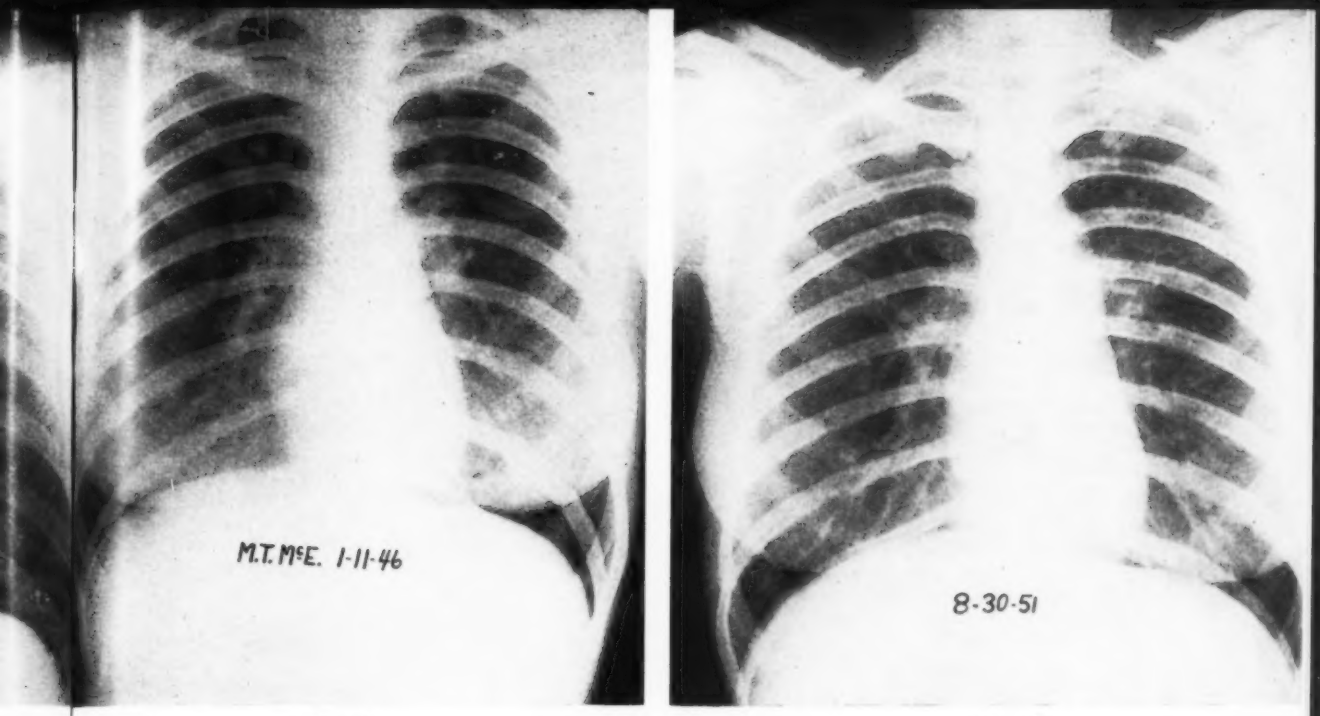

Fig. 3-A. Case 3. Fig. 3-B.

Mexican female, age 27 years. Worked one year as packer and two years as jeep driver in mill; three years as chemist in laboratory. No symptoms, delivered of healthy child in 1951. Skin tests with coccidioidin, histoplasmin and tuberculin (first and second strength P.P.D. and 10 mg. O.T.) all negative. Note in 3-b the development of bilateral mottling in mid-lung fields which simulates tuberculous infiltration.

particle sizes within the various products which may be of considerable importance in the pathogenesis of this disease. Crude diatomaceous earth and one of its products known as "natural powders" are apparently much less toxic, clinically, than some of the other forms. The rapidly progressive, coalescent lesions with resulting early disability as reported by Vigliani and Mottura, and which were also seen in California before the inauguration of adequate dust control, were in all probability due to intense exposure to one of the more toxic forms of crystalline silica. This toxicity as previously mentioned may be related not only to the type of crystalline silica, but also to particle size. A similar situation has been observed in other silica industries, i.e., bauxite fume pneumoconiosis,[7] and in men exposed to intense concentrations of very small particles of quartz such as have been reported by Sander[8] and Vorwald.[9]

Properly to understand this disease, it is necessary to have a basic understanding of the mineralogy, chemistry, and manufacturing processes. Diatomaceous earth is an amorphous form of silicon dioxide (SiO_2) and always exists in the form of an opal which is an amorphous hydrated silica ($SiO_2.nH_2O$) or silica and water in chemical combination. The manufacturing processes are briefly as follows:

The deposit is explored by test holes to determine the location of strata of commercially valuable diatomite, and quarry areas are laid out by use of data thus obtained. Top soil is removed and crude diatomite is taken out by power shovel and hauled to storage bins. These are actually large shafts or "glory" holes. A tunnel runs from the bottoms of the "glory" holes to the processing plant. Crude diatomite is drawn out of the holes through specially designed gates into mine cars. An electric locomotive hauls the cars through the tunnel to the processing plant.

Three types of powders are made: (1) natural, (2) calcined, and (3) flux-calcined. The natural powder is manufactured by drying, milling and air-classifying the diatomite. In the air-classifying operation impurities are removed as waste. The finished product is packed in 50-pound multiwall paper bags. The calcined product is made by passing the dried, milled, and air-classified diatomite through a rotary kiln at temperatures in the neighborhood of 1800° F. The flux-calcined product is made in the same way except that the diatomite is mixed with a flux or soda ash (sodium carbonate) before it is placed in the rotary kiln. After calcined and flux-calcined products leave the rotary kilns they are again milled, air-classified, and delivered to packer bins. Coarse and over-size particles removed in the air-classifying operation go to waste.

A number of other products are prepared by mixing diatomite with other materials in a mechanical mixer, in an area known as the mortar plant. Weighed amounts of the various ingredients are dumped into the mixer and after a definite period of time the charge is dropped into a bin below the mixer. It is then packed into multiwall paper bags. Various types of bricks containing diatomite mixed with other materials such as clays, asbestos, etc., and heated to high temperatures are also made in this area.

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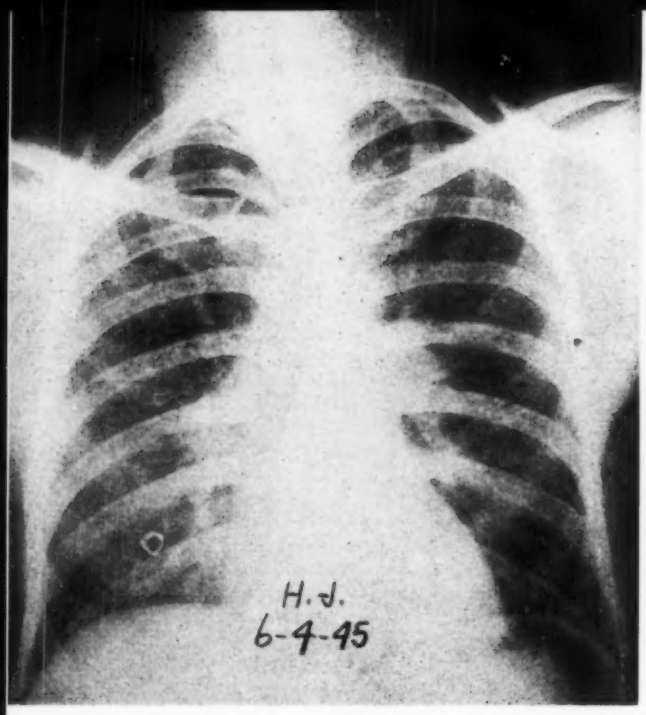

Fig. 4-A.

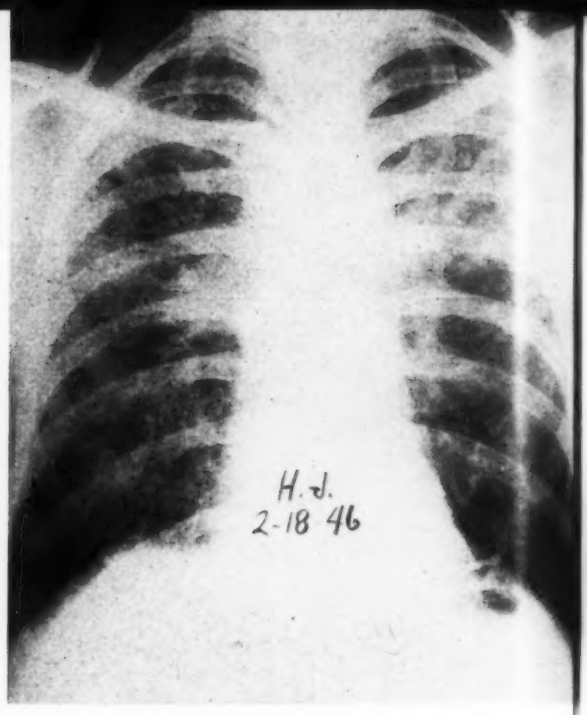

Fig. 4-B.

Case 4.

White male, age 51 years. Worked two and a half years as a packer. Advised, and left industry at time of first film (4-a). No dyspnea then. All skin tests completely negative up to 10 mg. O.T. Many sputum specimens and stomach washes negative on culture and animal inoculation. Films 4-b and 4-c show marked progression after cessation of exposure. Severe dyspnea now. Pulmonary function tests show marked impairment. Note location of dense fibrosis in perihilar areas in Figs. 4-c and 4-d, also bullous emphysema in bases and antero-superior lung fields.

Some of these manufacturing processes result in rather important physico-chemical changes in the original crude diatomaceous earth. The production of natural powders removes the water held in physical combination or adsorbed by the porous diatoms, but it does not remove the water held in chemical combination. As a result, finished natural powders are still true opals. The simple calcination process produces a slightly different product. Heating the natural powders to 1800° F causes a physico-chemical reaction with the formation of small amounts of

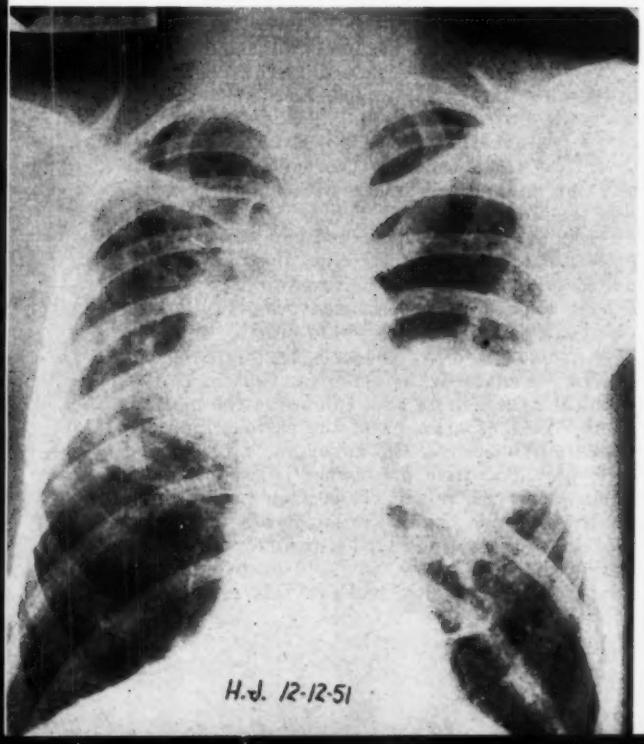

Fig. 4-C.

Fig. 4-D.

Case 4.

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a different form of silica known as cristobalite, a crystalline silica somewhat more toxic for animal tissue than quartz. Flux-calcination produces a much greater per cent of cristobalite with the formation of a trace of another form of crystalline silica, tridymite, which, according to Gardner,[10] is more toxic for tissue than is cristobalite. Some sodium silicate is also formed as a result of flux-calcination. Calcined powders contain 1% to 3% of cristobalite, whereas flux-calcined powders contain approximately 30 to 45% cristobalite and about 1% of tridymite.

Thus crude diatomaceous earth, originally amorphous in form, may be partially converted by various manufacturing processes into at least two forms of crystalline silica, and also into small amounts of sodium silicate. Inasmuch as several different products are manufactured and a number of these are of heterogeneous composition, we can expect the clinical, radiological, and pathological manifestations to be variable. The majority of the men employed in this industry have had exposures to many or all of the different products, and if pneumoconioses develop, they are apt to be of complex type.

It should be noted that great advances have been made by the manufacturers in dust control in recent years. Like all dusty trades, employee comfort requires continuous efforts to minimize dust, regardless of pathogenicity. With the advent of modern methods of dust control, exhausting and filtering, working conditions have improved greatly in this industry. Thus, many of the findings herein reported may have arisen some years ago under less favorable circumstances than now exist. Until the studies suggested above can be completed, it is impossible to relate degree of exposure to incidence of demonstrable disease.

We are presenting our clinical experience from six Pacific coast plants (three in California, two in Nevada, and one in Oregon) that are currently processing diatomaceous earth. The present clinical study makes no attempt to determine the incidence of morbidity or mortality in the workers employed in these plants. Such a study would involve the analysis of thousands of work histories, clinical records and chest x-ray films. A thorough study of such data is being undertaken as a joint project of the U.S. Public Health Service, the state Health Departments, and the three operating companies. One of us (R.H.S.) has been consultant to these manufacturers for several years and has had an opportunity to do detailed clinical and laboratory studies on approximately 100 workers. The authors have reviewed the work histories and chest films on several hundred additional employees.

In 1945 Dr. Leroy U. Gardner made a survey of the industry and since then an intensive effort has been made to secure post-mortem examinations on deceased persons who were ever employed in these plants. Twenty-two pathological examinations have been made since 1938. The pathological data are being correlated with individual work histories, chest films and clinical and laboratory studies, and will be reported in a later paper. Dr. Gardner instituted a number of animal experiments with various diatomaceous products in 1945. This work was completed and reported in 1949[15] by his successor, Dr. Vorwald, who is currently conducting additional animal experiments with these materials. It has seemed desirable to record our clinical and x-ray observations in these workers, after a brief resume of the pathological findings observed in the human cases.

Pathology

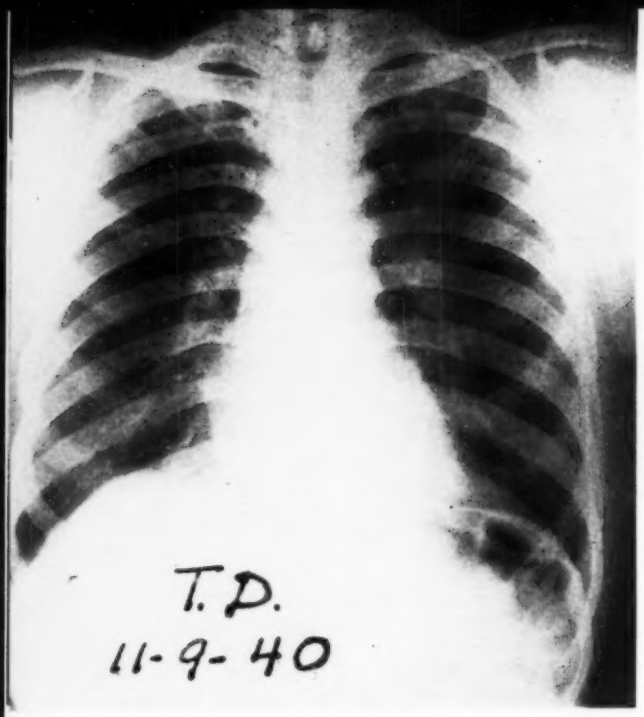
WE ARE indebted to Dr. Wm. H. Carnes, of the Department of Pathology, Stanford University School of Medicine, for the following brief summary of the pathological changes observed in the lung tissues of 20 workers* employed in this industry:

"The basic pattern of the pathological reaction to diatomaceous earth, described by Gardner in his note on the first seven cases of this series, has been present in *all* subsequent cases. This consists of a diffuse thickening of the pulmonary framework which is accentuated in the perivascular sheaths and contiguous alveolar walls. The thickening is due mainly to increased cellularity and is accompanied by more or less increase in delicate collagenous fibrils. There are conspicuous numbers of small multinuclear cells. Variable numbers of dust-laden phagocytes lie in the alveolar spaces. In *12 cases* this has been the *only* type of pulmonary alteration directly referable to dust.

"The rest of the cases have shown focal coalescence of the lesions to various extent. The coalescent lesions have varied from about 1 cm. in diameter to massive sizes, occupying the greater part of a lobe. The latter have been concentrated chiefly in the upper lobes and in the apices of the lower lobes. The coalescence is accompanied by extensive necrosis and, in the older lesions, by marked thickening and hyalinization of collagenous fibers. All four cases in which death seemed attributable to the pneumoconiosis have had extensive lesions of this character.

"The tracheobronchial lymph nodes have shown marked enlargement by massive accumulations of dust-laden phagocytes in those cases with advanced pulmonary lesions and in some of them

*Only four of these patients died directly of uncomplicated diatomaceous earth pneumoconiosis. Two other workers who died both had coalescent pulmonary lesions compatible with D.E. pneumoconiosis, and one of these also had quartz silicosis. (This was corroborated by the occupational history as well as by histologic and chemical study as mentioned by Dr. Carnes.) The other employee had carcinoma of the rectum with metastases to the lungs. Two cases were surgical specimens from pulmonary resections done for (1) chronic lung abscess and (2) actinomycosis, on patients who are still living. Other causes of death were: coronary thrombosis two; coronary insufficiency one; tuberculosis, miliary two, phthisis one; ruptured aneurysm two (luetic one, arteriosclerotic one); apoplexy one; subacute bacterial endocarditis one; carcinoma of the esophagus one; skull fracture one.



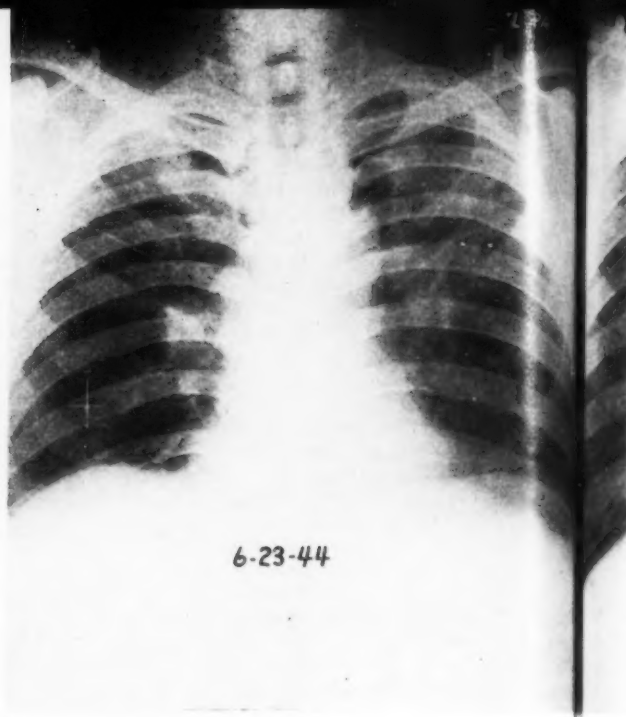


Fig. 5-A. Case 5. Fig. 5-B.

Mexican male, age 48 years. Worked six years in outside quarries and eight years in quarries and warehouse. Taken off work in 1944 because of bilateral upper lungfield infiltration thought to be tuberculosis (Fig. 5-b). Skin tests for tuberculosis positive but others negative. Many specimens sputa and stomach lavages negative on culture and animal inoculation. Employee in sanatorium one year and off work another year and a half. Minimal exposure to dust since return to work. Note development of massive coalescence and emphysema since 1944. Worker now has dyspnea and marked impairment of function tests.

focal areas of necrosis have occurred like those in the conglomerate lesions of the lungs.

"There has been a conspicuous absence of some of the cardinal features of typical silicosis, namely, the focal, discrete, hyaline nodules and the whorled pattern of the collagenous fibers. Only one case has shown these typical features of silicosis and his lung ash, unlike the others analyzed, contained a high proportion of quartz."

Chest X-ray Manifestations

IT SHOULD be emphasized that the majority of men employed in this industry have chest x-rays which show no recognizable abnormalities. Most of the employees, whose films we will show, have been in this work for periods ranging from 15 to 25 years. There are, however, a few notable exceptions. The workers who have developed pulmonary x-ray changes can be divided roughly into two groups: (1) those having pneumoconiosis of linear type, and (2) workers with coalescent or massive lesions.

LINEAR EXAGGERATION AND GENERALIZED MOTTLING: The largest number of men whose x-rays showed abnormal chest changes were classified as having simple linear exaggeration of the finer bronchovascular pattern of the lungs. We have divided these changes into three groups according to the classification of Sampson and Gardner,[11] and have designated them as first, second, and third stage linear fibrosis or pneumoconiosis for which we use the symbols: P_1, P_2, and P_3. The first stage, or P_1, has been called "the stage of imagination" or that degree of linear exaggeration of the terminal bronchovascular markings which is just barely recognizable on the film and is often debatable. Stereoscopic films of the very best quality are necessary in order properly to evaluate these pulmonary changes. The second stage, or P_2, is a definite linear thickening of the finer bronchovascular structures which is seen stereoscopically to extend well out towards the periphery of the lung fields but falls short of "cross-hatching," or "reticulation," and is not at all suggestive of nodulation. The third stage, or P_3, has been described as verging on first degree nodulation, or the so-called S_1 (first stage silicosis), and some have considered these two groups as synonymous. However, in this condition there seems to be a place for the designation third degree linear pneumoconiosis (P_3), for, when "nodulation" occurs in this disease, the so-called nodules are seldom as discrete or well defined as is seen in classical silicosis due to quartz. In association with these "linear" changes we have also frequently seen diffuse changes best described as "cross-hatching," "reticulation" or "fine mottling." At times this simulates a fine ground-glass appearance, especially at a distance, but on closer examination is seen to have a fine lacy-like character. Gardner[12] described this type of x-ray appearance as a "diffuse mottling" and likened it to the roughened appearance of the external surface of orange peel. We prefer to designate it as a fine mottling, which may be

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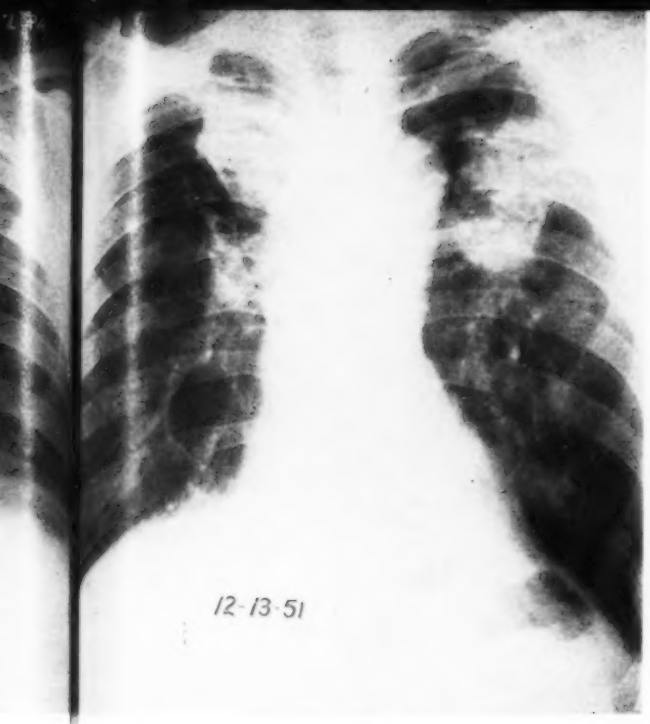

Fig. 5-C.

localized to the apices or infraclavicular zones, or may be more generalized in distribution. Amor[13] believes that reticulation "represents the next stage in the slow progressive advancement towards definite nodulation." However, in this disease we have seldom seen reticulation or fine mottling progress to nodulation even after the lapse of many years. Furthermore, we have seen reticular fibrosis progress to the stage of coalescence without passing through a recognizable phase of nodulation. Nevertheless, we have on rare occasions seen workers whose fibrosis can be best described as nodular although the nodules have fuzzy, ill-defined borders and are less discrete than in quartz silicosis.

MASSIVE OR CONFLUENT LESIONS: As in silicosis, we not infrequently have seen massive opacities develop. These are usually preceded by diffuse, fuzzy, localized mottling, as described above, rather than by generalized nodulation. We have seen coalescence of these ill-defined, fuzzy "mottles" in both the absence and the presence of demonstrable infection. Insofar as this disease is concerned, we disagree with Pendergrass[14] when he implies that coalescence always denotes associated infection, either concomitant, or pre-existing and healed. This will be discussed later. The confluent opacities are usually limited to the infraclavicular and mid-zones of the lungs. The opacities have a tendency to be localized in the postero-superior segments of the lobes. These opaque coalescent lesions have rarely occurred after comparatively short periods of exposure (two to three years), and sometimes have been noted to become massive, and to increase rapidly and occasionally for months (as long as three years) after cessation of exposure. They have sometimes progressed to the point of tremendous contraction of the dense opacities towards the hila with the development of concomitant bullous emphysema in the extreme apices and bases of the lungs. As in Shaver's disease, spontaneous pneumothorax is not infrequent and we have seen it in 10 workers, and in four of these it was bilateral. It was either the immediate or a contributory cause of death in three of 20 patients who have died. As might be expected, extensive pleural scars and adhesions are usually seen in the instances of massive coalescent fibrosis. The diaphragms although flattened are tented, distorted, and markedly restricted in their motion. In some instances the diaphragms are drawn upward by the extreme contraction of the fibrosis and the extensive pleuritis, in others the diaphragms are depressed by the severe emphysema in the bases.

Clinical Aspects

LINEAR LESIONS: The workers with linear fibrosis rarely have respiratory symptoms and can be compared to instances of pneumoconiosis due to so-called "inert dusts." Often the greater portion of dust exposure in the linear cases has been out of doors and to crude diatomaceous earth and natural powders. Many of the men with long exposures in the industry have chest x-rays that show only slight evidence of linear pulmonary fibrosis (P_1). However, we occasionally have seen men with prolonged exposure to crude diatomaceous earth and natural powders whose chest films have shown progression to a third stage (P_3) linear type fibrosis. Only rarely do they have respiratory symptoms. Recently have we had opportunity to do ventilatory pulmonary function studies (spirograms, timed vital capacity, and maximal breathing capacity), which will be reported in a later paper.

In the individuals having linear fibrosis we occasionally have observed localized x-ray changes that simulated super-imposed infection. Only rarely has it been possible to isolate a specific bacterium, even after using the most sensitive bacteriologic techniques available. In such cases tuberculin skin tests have usually *but not always* been positive. When infiltrative or localized mottled lesions have appeared in the chest films of men showing linear fibrosis of minor degree, (P_1, P_2), these infiltrates, which we formerly had presumed due to tuberculous infection, have often shrunk or contracted somewhat, especially if exposure to diatomite ceased.

In the few patients who have later developed frank tuberculosis, it has been extremely difficult to demonstrate tubercle bacilli before the advent of cavitation. When cavitation occurs, the response to treatment is poor and not unlike that seen in silico-tuberculosis. This is true in spite of intensive treatment with sanatorium care, chemotherapy and collapse procedures. However, infiltrates that later underwent cavitation and were proved to be due to tuberculosis,

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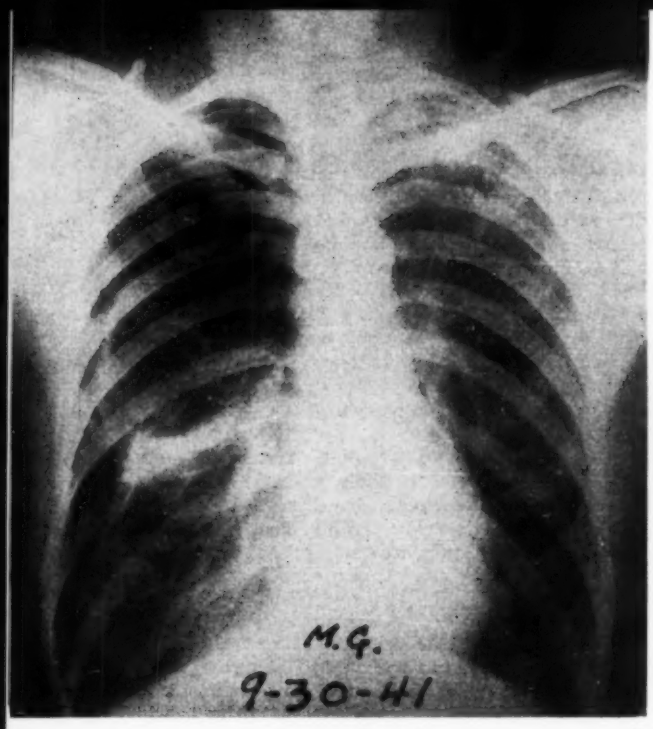


Fig. 6-A.

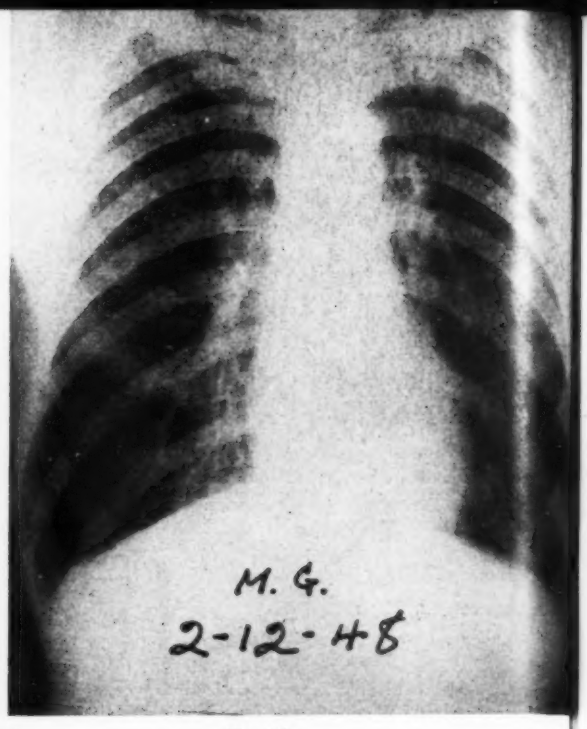


Fig. 6-B.

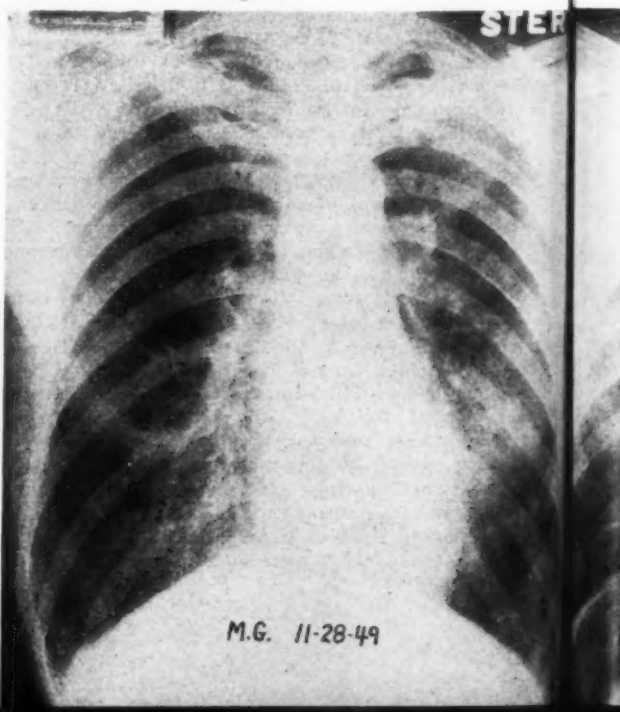
Case 6.

Mexican male, age 50 years. Worked 18½ years in the sackroom and warehouse and four years in the laboratory. Tuberculin skin tests positive, others negative. Developed right spontaneous pneumothorax in 1941 (Fig. 6-a). Placed in sanatorium but sputum and gastric lavages negative to all tests. Employee left sanatorium after one year and resumed non-dusty job after two years. Infiltration increased (Fig. 6-b) and sputum became positive in 1949. Patient confined to sanatorium past three years, receiving pneumoperitoneum refills, streptomycin, PAS and Isoniazid. Sputum remains positive although cavity is smaller but not closed. Pulmonary function tests show only slight impairment.

Fig. 6-C.

could not be readily distinguished in their pre-cavitary stage from uncomplicated confluent lesions. We have apparently seen a greater incidence of acute pulmonary infections such as pneumonia and pneumonitis than in the general population, which may be due to the associated emphysema. Furthermore, acute pneumonic processes do not always completely resolve and may leave extensive fibrous scars. Physical findings on chest examination were not abnormal unless infection or emphysema was present.

COALESCENT LESIONS: Of the men whose films showed only linear pulmonary fibrosis, the great majority have pursued a benign course as described above. However, we occasionally have seen individuals who developed linear pulmonary fibrosis that was progressive, and showed a great tendency towards confluence or coalescence and was followed by marked pulmonary disability and occasionally death. These men often had dyspnea, cough, dull chest pain, and sometimes cyanosis and polycythemia. If expectoration was present, it was usually scant and when combined with gastric washings has been negative for tubercle bacilli on repeated culture and animal inoculation, unless frank tuberculous cavitation was present. Dyspnea was the outstanding symptom and may develop early and be out of proportion to what is seen on the x-ray. It was the chief cause of disability. The vital capacity and maximal breathing capacity were diminished, and the breath-holding time was shortened. Spirograms showed marked prolongation of expiration. Unless manifest tuberculosis was present, fever and night sweats were absent and the blood sedimentation rate was usually consistently normal, even in the absence of polycythemia. (Polycythemia was rare and usually mild.) Al-



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though infection may play a role in the pathogenesis of confluent lesions, we have seldom been able to prove it clinically or pathologically, and in many instances we feel it has been excluded both on clinical and laboratory examination, and occasionally by post-mortem studies as will be discussed later.

Persons having confluent opacities in the infraclavicular or mid-lung fields frequently have developed marked bullous emphysema particularly in the pulmonary apices and bases. This was always associated with shrinking and contraction of the coalescent lesions. The emphysema occasionally has resulted in spontaneous pneumothorax which rarely has been the immediate cause of death. Unlike the cases of simple linear fibrosis, we have often seen marked progression or increase in the confluent lesions for months and even as long as three years after dust exposure had ceased. This progression has occurred in many patients where active infection has been excluded as will be described hereinafter. In other instances the progression has appeared to halt, especially if the employee was removed from exposure. In these latter cases there often has been some apparent improvement in the dyspnea.

Physical examination revealed markedly impaired resonance over the coalescent areas which usually were located posteriorly. Bronchial breath sounds with fine rales were frequently noted over these opacities. The emphysematous areas gave the usual findings of hyper-resonance and diminished breath sounds with prolonged expiration. Although Legge and Rosencrantz reported finding a rather high incidence (72.9%) of clubbed fingers, we have never seen frank clubbing of the fingers in our patients.

Cor pulmonale has been an important complication, especially in those patients with massive coalescent disease. Of 20 workers* who died from one cause or another it was a contributory cause of death in 10. It is a prominent feature in several of the patients who are still under observation.

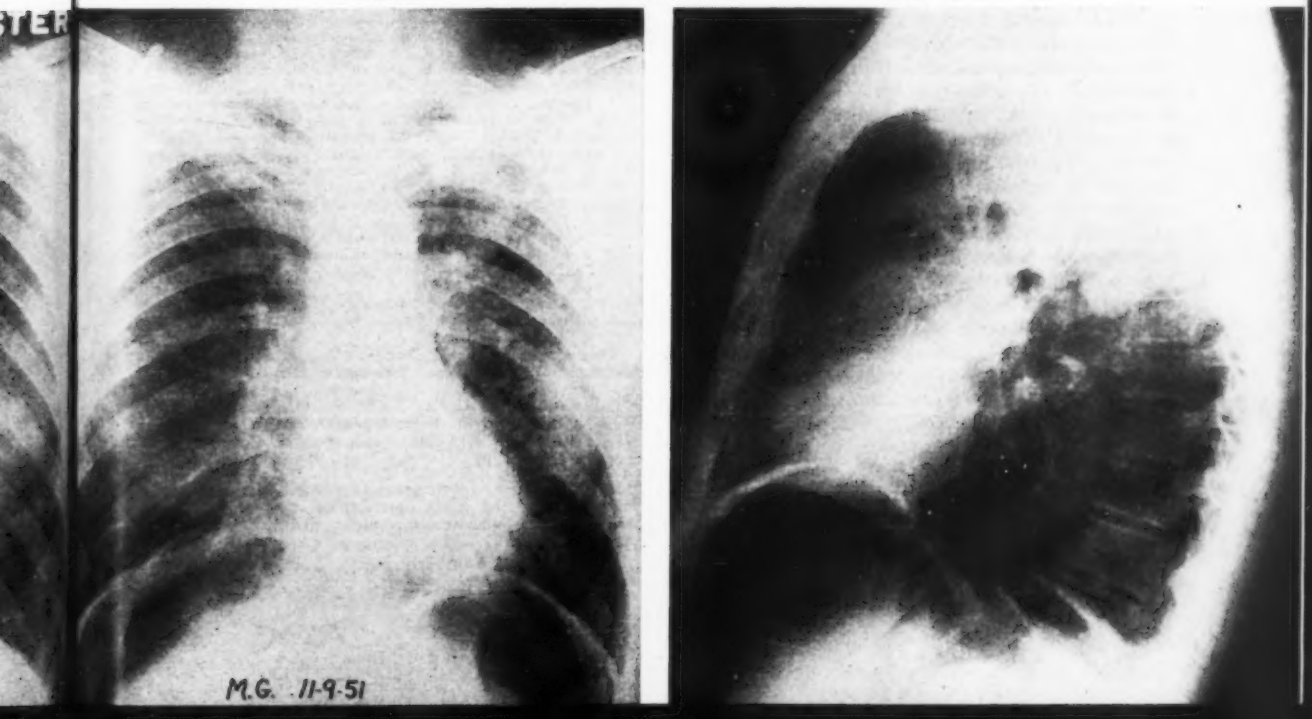
One of us (R.H.S.) has been consultant for several years to four plants processing only fresh water diatomite, and although all workers are x-rayed annually, we have never seen coalescent lesions develop among these men. The diatomite is subjected to flux-calcination in only one of these plants, but a number of men have been employed there for over 10 years. We have also observed that linear pulmonary x-ray change are found among these workers very infrequently, and then are only of minor degree (P_1). The explanation for this apparent lesser toxicity of fresh water diatomite is not known.

The Role of Infection

COALESCENT LESIONS: Intra-dermal skin tests with histoplasmin, coccidioidin and tuberculin were frequently negative. In several cases having massive coalescent lesions, repeated tests to full dosage with tuberculin (P.P.D. and O.T.) were consistently negative. Repeated acid-fast cultures and animal inoculations of combined specimens of sputum and stomach washings have been negative in most of the cases of confluent disease. However, a total of nine patients have developed frank pulmonary tuberculosis, several with cavitation, and a number of these are now in sanatoria. In only one other patient were we able to demonstrate consistently any

*Necropsy was not obtained in two workers observed to have cor pulmonale during life.

Fig. 6-D. Case 6. Fig. 6-E.



other micro-organism in the sputum even after intensive study. This was a Friedlander's bacillus and was thought to be a saprophytic infection during life, and also later at post-mortem examination. Fungous cultures of the sputum have been consistently negative. Whenever coccidioidin skin tests proved positive, blood serological studies (complement fixation and precipitins) were done and these have always been negative. One worker with coalescent disease gave a history of Brucella infection and the skin test and blood agglutination were positive. At necropsy no evidence of brucellosis was discernible in the lungs or elsewhere. In our experience the clinical, laboratory, x-ray, and pathological evidence does not indicate that concomitant infection plays a significant part in the pathogenesis of the coalescent form of this disease.

INFECTION IN THE NON-COALESCENT FORMS OF THE DISEASE: In workers having linear, reticular or generalized mottled types of fibrosis we have occasionally seen localized apical or sub-apical infiltrates which were radiologically compatible with tuberculosis. Tuberculin skin tests have usually, but not always, been positive in these cases, but bacteriologic studies of the sputum and gastric contents have nearly always been negative. Most of these lesions, formerly presumed tuberculous, have remained stationary or regressed without treatment. However, in a few instances they have progressed, with the subsequent development of open tuberculosis. Four patients with tuberculous cavitation responded, at first somewhat encouragingly, to sanatorium treatment. The cavities closed by "blocking," and sputum specimens became negative for a time but subsequently reverted to positive. On the x-ray films these cavities although closed temporarily by "blocking," (not the most desirable form of cavity closure), later re-opened. Nevertheless, we have never previously observed even temporary "blocking" of tuberculous cavities complicating nodular quartz silicosis. Two patients in the necropsy series died of miliary tuberculosis, and another has recently died of progressive phthisis. Dr. Gardner examined the tissues of the patients with miliary disease and was of the opinion that the pneumoconiosis did not pre-dispose to the tuberculosis. Our consulting pathologists have not yet reported on our most recent death from tuberculosis.

Other complicating infections which we have identified (one each of actinomycosis and chronic lung abscess) have been considered as intercurrent infections, and as not contributing etiologically to the pneumoconiosis. However, one can not say that the pneumoconiosis did not predispose to, or aggravate the infections.

Conclusions

1. THE INHALATION of diatomaceous earth may produce a distinct type of pneumoconiosis.

2. The inhalation of crude diatomaceous earth and natural powders over a long period of time may produce a benign type of linear pulmonary fibrosis, leading to few if any symptoms and no demonstrable disability.

3. The calcined and flux-calcined powders may occasionally produce a rapidly progressive pulmonary fibrosis or granuloma with massive coalescence, bullous emphysema, extensive pleuritis, cor pulmonale, and not infrequently spontaneous pneumothorax.

4. Massive coalescent pulmonary lesions occasionally have developed in persons whose intradermal skin tests were completely and repeatedly negative to full dosage of standardized tuberculin, and in these cases we have been unable to identify tuberculous infection either during life or at post-mortem with the most sensitive bacteriologic and histologic techniques that were available.

5. When tuberculosis is superimposed on diatomaceous earth pneumoconiosis the infection often pursues a benign course until cavitation supervenes, then the course seems to be slowly downhill in spite of modern treatment including collapse procedures and chemotherapy.

6. Fresh water diatomite appears to be much less toxic for workers engaged in processing this material, even when it is subjected to flux-calcination, than are marine diatomaceous earth products.

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Disability Evaluation

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THE passing of the horse and buggy days in the practice of medicine took with it the more or less self governing privileges enjoyed by the medical profession. The responsibility of evaluating the extent of disability in industrial and liability injuries is one more obligation added to the modernization of medical practice.

The patient with a monetary claim is often avoided because information and opinions on the case are subject to questioning in court and violate the private relationship of the doctor and his patient. Whether the medical profession approves or disapproves, the statutes provide that the extent of personal injury and permanent disability can be determined only through evidence established by medical opinion. The evaluation of disability would not be so difficult to determine were it not for the fact that the percentage of disability is placed on an economic basis, rather than a physiologic and anatomic basis. Benefits are for persons who earn wages, in respect to their ability to perform useful services in varying degrees of the ordinary activities of life. The loss of these services results in monetary loss, either directly or indirectly. If it were possible accurately to vary and efficiently to measure disability on the basis of actual body loss, and not in terms of so much money, those medically trained would not feel reluctant to render an unbiased opinion.

Fixed Schedule Disability Awards

PRACTICALLY all states and provinces have adopted schedules for determining specific losses. They establish a specific award for the loss of one eye, or both eyes, for the loss of hearing, for the loss of arm, leg, hand, or foot by amputation at certain levels. These schedules are not based upon scientific studies and cannot very well be related to any specific rules relative to actual loss of wage produced by any of the specified disabilities. The awards are supposed to represent an average wage loss covering a large number of laborers. The statutes therefore establish a limit as to the amount of a total award for 100% disability for amputation, or a total permanent disability. In the evaluation of partial permanent disability, where the limb or injured part of the body is not amputated, disability evaluation must be a rating somewhere between 0% and 100% of that amount allowed by the specific award of the statutes. We must conclude therefore that the evaluation of disability before an Industrial Court, or a Board of Pensions, is not an evaluation of disability of the individual at all, but of a compromise award.

Medical analysis and opinion, in other words, must satisfy the demand of the court which requires evidence established by medical opinion on the extent to which the injured or disabled individual is entitled to some, or all, of the award for the disability as specified by the statute.

The result is that medical science is called upon, not only to describe the anatomic and physiological alterations due to injury, but to express as well the percent of permanent disability. The Industrial Commission, or Pension Board, may then weigh the medical evidence and decide upon the extent of wage loss and industrial incapacity. Medical opinion therefore measures the disability in terms of physiological loss, and this extent of loss, as far as possible, is used to measure the economic loss. It is obvious that under such a system the individual is compensated only partly for his economic loss and personally must suffer the remainder of the loss. Such a system has resulted in the adoption of schedules for partial disability in some sections, such as the Veterans' Administration schedule, for determination of benefits, but it still remains necessary that each case of disability be decided on its individual merits.

In light of these facts medical science must avoid criticism, or wide differences of opinion, expressed before Industrial Boards and in the courts. Testimony in which widely different opinions are expressed creates a lack of confidence. Evidence of sound reasoning, together with a sound basis for the evaluation, as expressed in testimony, greatly assists the court in rendering wise and equitable decisions.

Most claimants will be found to have something wrong with them when investigation is completely impartial and thorough. It may not be to the extent that the claimant thinks it is, but it is something tangible and definite that the claimant knows prevents him from working.

Medical Approach to Disability Evaluation

THE approach to the examination of a claimant for disability involves many factors that would not be considered in the regular doctor-patient relationship. The examination will include: (1) History. (2) Clinical Findings. (3) Laboratory and X-ray Findings. (4) Opinion and State of Disability: (A) Total Disability, as to (1) temporary total: (2) permanent total. (B) Partial Disability, as to (1) temporary partial; (2) permanent partial.

History

WHERE the injury, responsible for the disability, is somewhat indefinite and question-

Presented at the Thirty-Seventh Annual Meeting of the INDUSTRIAL MEDICAL ASSOCIATION, Section on Surgery, Cincinnati, April 24, 1952.

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able as to its extent and seriousness a complete history may require not only interrogation of the patient, but also many times information from others, such as relatives and fellow employees. It is quite natural that the claimant should develop a neurotic overlay and an attitude of apprehension where multiple examinations have been made and where delay and uncertainty in decision of settlement have been repeatedly extended. Most claimants do not actually make a conscious effort to deceive but they have fixed in their consciousness that the injury they received, or the condition they find themselves in after some kind of injury, is directly related to their inability to go back to work. They know that for some reason or other they cannot function as they know they should in order to hold their job. It is human nature to exaggerate for the purpose of self aggrandizement. Self sympathy and pity often dominate the mental reactions of a claimant and he is likely to find some form of blame for the accident or event that, in his mind, has been the cause of his not being able to return to work. The past history is important because it is often necessary to differentiate and evaluate the influence of a pre-existing disease, or injury, which might be an influence on the present disability.

Clinical Findings

THE examination in cases involving a claim for disability entails an exceptional investigation that will substantiate, or disprove, the symptoms described by the claimant. The clinical report will consist of: (1) Negative findings. (2) Pathology of recent origin. (3) Pathology pre-existing the injury.

Negative clinical findings do not disprove the claim of injury. For example: "A ruptured semilunar cartilage may be present without definite objective clinical evidence."

The results of recent injury are the physiologic basis of disability. The elicitation of disabling factors should show a quantitative as well as a qualitative analysis. For example: "It is hardly enough to describe such mechanical factors as a shortening and angulation in a fracture without including associated factors, such as swelling, atrophy, paralysis, and pain."

Pre-existing pathology should be painstakingly differentiated from recent pathology with as definite analysis as can be made. For example: "A vertebra may be found to be wedged and claimed as a recent injury. A knowledge of all the causes for a wedged vertebral body should lead to a clear explanation of the true pathology."

Laboratory and X-ray Findings

THE routine laboratory tests are important. It is not unusual to find an anemia, or a diabetic condition, as the basis of a prolonged disability.

The x-ray is an indispensable aid to a diagnosis. It may confirm or disprove suspected pathology. The x-ray also is sometimes used for the purpose of supporting an unworthy claim. Great caution should be used in over-emphasizing irregular and indefinite shadows that might lead to a false conception of injury.

Opinion on "State of Disability"

ORDINARILY the extent of disability is an evaluation, based on the status of the individual, after maximum improvement has been reached. It is necessary therefore to determine whether the disability found on examination is temporary or permanent, and, whether there is total disability or partial disability.

Temporary Disability

TEMPORARY disability is often misconstrued as permanent disability. Where settlement is to be made prior to the maximum improvement, the period of temporary total, or temporary partial disability, should be determined, after which the permanent partial disability may be evaluated. The temporary period will include active treatment and follow-up examinations to the time it can be said the "healing period has ended" and the claimant is able to return to some gainful occupation. Further readjustment may extend into a period of time, even after resumption of labor.

Permanent Disability

PERMANENT disability implies a lifetime limitation of working capacity in a gainful occupation. The specific awards of the compensation and pension laws are based on amputation, or the loss of an eye, which are unquestionably permanent. An injury followed by disability that is still improving is not a permanent disability, so that one of the very important objects of medical opinion is to differentiate between what is temporary disability which will improve, or possibly get worse, in time and what is permanent disability that has reached a fixed state for life.

Formulation of Medical Opinion

THE formulation of an opinion on the percentage of disability requires medical judgment on the following phases of the claimant's status as a laboring individual: (1) The physiologic effect of anatomic and mechanical alterations. (2) The possibilities of readjustment and rehabilitation. (3) Statutory awards specified for amputations and permanent disability. (4) Measurement of functional capacity to work and earn wages. (5) Reactionary factors further influencing his ability to work. (6) The application of the disability to a specified occupation, or work in general.

Mechanical Alterations

THE mechanical alterations of the muscles, bones, and joints, as the result of an injury create physiologic states and dynamic alterations in the movement, contour, and geometric

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relations of the structures involved. The leverage action of joints is changed by deformity, which alters the joint axes and range of motion. The column strength of bones is weakened by angulation and the kinetic forces are altered by stiffness and weakened muscles. Physiologic loss of function in various organs of the body, such as injury to the brain, is interpreted in terms of disability to the working capacity of the whole.

Possibilities of Readjustment and Rehabilitation

THE readjustment possibilities of a disabled individual will depend greatly on the complex influences incorporated within the mind and body of the person, as well as the social and economic opportunities, or disadvantages. Some employers will encourage rehabilitation by providing selected work; others do not permit re-employment until the injured person is able to fulfill all requirements of his job. When left to the claimant's own initiative many obstructing factors may arise to discourage him.

Statutory Awards for Specific Disabilities

THE statutory award provided for such specific injuries as an amputation, or the loss of an eye, represents 100% loss for that particular permanent disability. Where the loss of use of the extremity, or organ, does not equal amputation, it is rated a percent of partial permanent disability. The grading of partial permanent disability will be therefore from 0% to 100%. The opinion as to the extent of disability of the limb or body should fit the scale of grading from the most minor disability, such as the loss of the little toe, to that of a major disability, such as the loss of both eyes. For an examining physician to render an opinion on permanent disability, obviously of a much higher percentage than reasonable, is to invite distrust. Grading averages are useful in classifying the seriousness and extent of disability:

1. Low degree, or very minor	5% to 20%
2. Moderately low minor	20% to 35%
3. Moderate degree to medium high	35% to 50%
4. High moderate to low major	50% to 65%
5. High degree major	65% to 80%
6. Maximum	80% to 100%

Measurement of Functional Capacity for Work

THERE is no schedule that can adequately define and classify all the variations of physical disability. Each case must receive individual consideration. Disability is based on function and the measurement of disability is to measure the ability to work.

The author has outlined and previously published a measuring-rod for determining the percent of function, or loss of function, and if it can be determined what the claimant is actually able to do, or not to do, with the disabled part of the body, or irrespective of it, then the percentage of disability or the physiologic basis may be reasonably determined. The author uses essentially seven factors of function, each of which may be given a percentage value:

1. Quickness of action	10%
2. Security	10%
3. Coordination	20%
4. Strength	20%
5. Endurance	20%
6. Safety as workman	10%
7. Re-employment examination	10%
	100%

An example of the use of this formula would be as follows: "The case may consist of an injury to the knee resulting in a limited arc of motion from 180° extension to 45° of flexion." The loss of the seven functional factors may be judged as follows:

Quickness and speed (value 10%)	35%—3.5%
Security (value 10%)	25%—3.5%
Coordination (value 20%)	35%—7.0%
Strength (value 20%)	25%—5.0%
Endurance (value 20%)	40%—8.0%
Safety (value 10%)	35%—3.5%
Employability (value 10%	25%—2.5%
Total Function Loss	32.0%

Reactionary Factors an Influence on Disability

THERE are a great many factors which make it impossible to determine, accurately, the extent of disability based solely on the physiologic or economic loss. These factors are as follows:

1. Rehabilitation obstacles.
2. Limited occupational opportunities.
3. Economic handicaps.
4. Limited educational background.
5. Adverse incentive toward work.
6. Adverse social relations.
7. Unfavorable labor situations.
8. Age limitations.
9. Unpredictable exacerbations of pain or other symptoms.
10. Other body impairment or disease.

Such factors undoubtedly have a strong bearing on disability. They may be keenly realized by the physician but are more or less out of his jurisdiction, consequently, he should bear them in mind and apply them only in a relative way when he feels they are of physiologic importance.

Specific Occupation or Work in General

THE measuring-rod of function may be applied to determine the ability to work at a single specified occupation, or, it may apply to work in the general labor market. For example: "A man working as a railroad brakeman might be 100% disabled in all factors for his particular job but for all other forms of labor his physiologic function would be only partially disabled."

Summary

DISABILITY evaluation requires especial knowledge and training. The author has presented the processes of arriving at a reasonable and trustworthy opinion in the rating of disabilities.

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The Evaluation of Hypertension

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HYPERTENSION is defined as an abnormal elevation of the diastolic blood pressure, often with a concomitant elevation of the systolic pressure. Any blood pressure above 150/90 is indicative of elevated blood pressure. It represents an effect rather than the cause of the basic disorder, and at times the complications developing in such organs as the brain, heart and kidneys overshadow the hypertension itself. From a practical point of view, in less than 5% is a specific causative factor established in the hypertensive state and it has given rise to the term essential hypertension. This is characterized by the presence of hypertension resulting from increased peripheral resistance in the arteriolar system and other causes of hypertension are absent. It is rare before the age of 40, only 5%, and it is associated in some unknown manner with the degenerative processes in the body which seem to manifest themselves after 40 years of age.

Hypertension sometimes will remain relatively static as in benign essential hypertension, but at other times progressive changes develop in the arteries of the body to give rise to the complications of hypertension with arteriosclerosis. When the heart is predominately involved with hypertrophy and myocardial failure, we are faced with the situation of hypertensive heart disease. Occasionally, the changes in the arteries of the optic fundi, brain and kidneys (but rarely the heart) occur with such explosive rapidity and extensiveness that we speak of the condition as malignant hypertension. Perera[1] has grouped all these manifestations of hypertension under the inclusive term hypertensive vascular disease.

The systolic hypertension found in hyperthyroidism, aortic insufficiency, and in marked sclerosis of the aortic arch in older persons should not be included in those conditions in which there is an elevation of the diastolic blood pressure. Clinical examination should rule out renal, endocrine, neurogenic and cardiovascular abnormalities that can also cause diastolic hypertension such as nephritis, pyelonephritis, pheochromocytoma, pituitary basophilism, brain tumor and coarctation of the aorta, which can mimic hypertensive vascular disease.

Physicians are aware of the variability that does occur in determining blood pressure and it is the repeated finding of hypertension when other causes of diastolic blood pressure elevation are excluded, that confirms the diagnosis of hypertensive vascular disease. But there may be periods in the course of this illness in which the blood pressure is not elevated and the concomitant vascular changes may proceed to cerebral thrombosis, coronary occlusion, or myocardial fibrosis. Also it is not uncommon for elevated blood pressure to revert to normal after a cerebral thrombosis or a coronary occlusion and at times with cardiac failure. Therefore, the hypertensive state is considered but one manifestation of degenerative cardiovascular disease.

Variability in Normal Blood Pressure

THERE are wide variations in "normal" blood pressure and recent work, notably by Master, Dublin and Marks,[2] advocates higher limits of normal blood pressure than ordinarily employed. This is especially true after the age of 50 when it is not uncommon to observe patients with systolic pressure of 160 to 190 and diastolic pressure of 100 to 110 who are in good health and present no other cardiovascular abnormality.

If the definition of the normal range of blood pressure is to be modified, it should be appreciated that this is applicable mainly in the older age group. The significance of "borderline" blood pressure levels in young men remains to be fully appraised. This refers to those readings a little over 150 systolic and 90 diastolic when they occur transiently at the beginning of an examination and subside on quiet rest for one-half hour. A follow-up study on cardiovascular rejectees for military service by White, et al.,[3] revealed that of 67 men among the total of 303 who showed transient hypertension in 1943, 33 had normal blood pressure in 1947, 17 still showed transient hypertension, and 17 were found to have sustained hypertension. The correlation with increased weight in this group was not conclusive and the authors stated that longer follow-up would be necessary. But to the industrial physician, the finding of increased weight and transient hypertension in pre-employment examination of young men should suggest that this combination in a certain percentage may lead to an increase incidence of hypertensive vascular disease. In this type of case the necessity of weight reduction as a preventive medical measure is obvious.

Classification of Hypertension

IT IS EVIDENT that in evaluating the hypertensive state, the whole clinical picture must be taken into account rather than the level of blood pressure elevation. The history, physical examination, optic fundi, cardiac size, electrocardiogram, even the exercise electrocardiogram, ballistocardiogram and renal function are all important

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TABLE I.
PROFILE OF HYPERTENSIVE VASCULAR DISEASE

	Clinical Signs	Essential Hypertension	Hypertension and Arteriosclerosis Without Symptoms	Hypertension and Arteriosclerosis With Symptoms	Malignant Hypertension	Hypertensive Heart Disease
Symptoms	—Cerebral	0	0	±	+	±
	Cardiovascular	0	0	±	+	+
	Renal	0	0	±	+	±
Signs	—Cardiac Enlargement	0	±	+	+	+
	Myocardial Failure	0	0	0	+	+
	Aortic Murmur	0	+	+	±	+
	Cerebral Accident	0	0	±	±	±
Optic Fundi	—Hemorrhage or Exudate	0	0	±	+	±
	Papilledema	0	0	0	+	0
EKG	—Myocardial Damage	0	0	±	+	+
	Coronary Thrombosis	0	0	±	±	±
Fluoroscopy	—Cardiac Enlargement	0	±	+	+	+
	Abnormal Aorta	0	+	+	±	+
Renal Function	—Albuminuria	0	±	±	+	+
	Uremia	0	0	±	+	±

in judging the extent of the disease. While individual blood pressure readings over the years do not appear to contribute directly to this evaluation, O'Hare and Holden[4] in a recent report on benign essential hypertension have listed three important exceptions to this rule: (1) patients who maintain a low level of hypertension for years, never above 180/120, seem to have a longer life span; (2) low basal diastolic pressure suggests a favorable course; and (3) a steady rise of diastolic pressure into high levels forbodes strain on the cardiovascular system.

The following classification of hypertensive vascular disease has proved valuable in our clinical work. The findings listed below and in Table I have served to develop a "profile view" of each case, realizing full well that some cases may not fit all the findings listed.

(1) Essential Hypertension

THIS type of case has variable levels of blood pressure elevation even up to 280/140. The patients are usually asymptomatic. While essential hypertension may be compatible with years of survival and well-being it is important to detect the signs that point to myocardial failure, coronary disease and cerebral thrombosis. These complications are responsible for the restrictions in work capacity and the decrease in life span.

Optic Fundi—normal, or retinitis to grades 1 and 2.

Cardiac Size—normal.

Aorta—fluoroscopy reveals a normal aorta. This type of case may have mild to moderate dilatation and elongation of the aorta depending on the age group and the duration of hypertension.

Electrocardiogram—normal.

Renal Function—normal.

The hypertensive diencephalic syndrome is a form of essential hypertension in which the levels of blood pressure are intermittently extremely variable (260/130 to 130/80). The most characteristic sign is the appearance of a blotchy, red blush over the neck and upper thorax with any emotion. Excessive perspiraton is present. Tachycardia is frequent, and the basal metabolism may be elevated. The course of the illness is prolonged and vascular disease may be minimal even at 55 or 60 years of age. The patients usually die eventually of cerebral hemorrhage.

(2) Hypertension and Arteriosclerosis

THE arteriosclerotic complications of hypertension may produce only a few symptoms if the process involves mainly the larger arteries such as the aorta. When the coronary arteries and optic fundi are involved, the hypertension is more apt to be associated with systemic symptoms and the prognosis is more grave. On this score the report of O'Hare and Holden[4] is interesting. For example, they noted coronary insufficiency in 51% of their group of 100 patients with essential hypertension and in the 29 who died this symptom occurred in all but eight. Coronary thrombosis occurred in 20 of the deceased patients, although it was the primary cause of death in only eight cases. Their observations on the optic fundi disclosed that advanced changes in the retina and optic discs were relatively infrequent in benign hypertension but marked arteriolar sclerosis, grade 3, was present in more than one-third of the deceased cases.

(a) *Hypertension and Arteriosclerosis without Systemic Symptoms.*

Arteriosclerosis of the aortic arch is the important clinical finding in this type of case. It has been agreed that only marked changes in the aorta on fluoroscopy such as dilatation, elongation and tortuosity of the arch would be taken as a criterion of arteriosclerosis of the aorta. Since it is evident that some widening, elongation and tortuosity of the arch are common in the decades of 50 and 60 years, and appear exaggerated on fluoroscopy, it has become necessary to exclude mild and moderate changes. The evaluation of this depends upon the interpretation and experience of each examiner, but the use of marked changes in the aorta as the basis of diagnosis should eliminate most of the variables. A systolic murmur at the aortic valve area transmitted to the neck with only moderate changes on fluoroscopy will also indicate sclerosis of the aortic arch. Hypertension and arterio-

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sclerosis without system symptoms demonstrate the following findings:

Optic Fundi—retinitis up to grades 1 and 2. Grade 3 retinitis is rare.

Cardiac Size—minimal changes in cardiac shadow on fluoroscopy.

Aortic Arch—the sclerotic changes described above.

Electrocardiogram—normal, or minimal changes.

Renal Function—normal. Some albuminuria may be present but the urea nitrogen is normal.

(b) *Hypertension and Arteriosclerosis with Systemic Symptoms.*

There may be cerebral manifestations of dizziness and some headache but this is not a major complaint. Cerebral thrombosis can occur. Angina pectoris may be present and coronary thrombosis can develop as a complication.

Optic Fundi—May show an increased incidence of grade 3 arteriolar sclerosis with sporadic hemorrhages and exudate.

Cardiac Size—May be abnormal but signs and symptoms of myocardial failure are not present.

Aortic Arch—sclerotic changes as described above.

Electrocardiogram—is abnormal, with left ventricular strain pattern or other evidences of myocardial damage may be present.

Renal Function—usually normal.

(3) Hypertensive Heart Disease

THE dominant finding in this type of case is myocardial failure as noted by symptoms of dyspnea, edema or heart pain.

Optic Fundi—variable; marked retinitis may be present.

Cardiac Size—cardiac enlargement is present and some evidence of myocardial failure. Fluoroscopy should confirm cardiac hypertrophy of the "inflow" and "outflow" tracts of the left ventricle.

Aortic Arch—usually shows signs of arteriosclerosis as noted above.

Electrocardiogram—usually abnormal.

Renal Function—variable; albuminuria and nitrogen retention may be present.

(4) Malignant Hypertension

THE malignant phase of essential hypertension is a clinical diagnosis. It is based on the presence of papilledema and hemorrhagic retinopathy. It may appear at any age from seven to 50, unheralded and lightning-like, in a person without known vascular disease. Usually, however, it is engrafted upon a pre-existing essential hypertension. This phase can supervene in any type of hypertension; essential, arteriosclerotic, and nephritic. It is rapidly fatal as a rule with a progressive downhill course. Headache is a dominant symptom.

Optic Fundi—the abnormality of choked discs, retinal hemorrhages and exudate are a classical clinical picture.

Cardiac size—cardiac hypertrophy is usually present.

Aortic Arch—abnormal aortic arch findings may be absent or minimal due to the rapidity of the disease process.

Electrocardiogram—reflects myocardial damage and sometimes the pericarditis from uremia.

Renal Function—uremia supervenes rapidly in many cases.

Prognosis

BURGESS[5] has rendered an interesting report on 100 cases of excessive hypertension, with systolic pressure of 180 and diastolic pressure of 100, of long duration. He found that in hypertension, even of excessive degree, which had been present eight years or more and had not progressed into well-established cardiac or renal disease, the patient usually lived to within three or four years of his normal life expectancy. But the younger the patient at the time when hypertension developed, the less likely he was to live out his life span, as shown in the group under 50 years of age where the average length of life was about 11 years below the estimated life span. Elevated systolic pressure in itself was not an unfavorable prognostic sign. The unfavorable influence of a high diastolic pressure, 120 or higher, was demonstrated by the fact that the deficit in life expectancy was much greater than in the group where the diastolic pressure was below 120. This report encourages the industrial physician in handling the older hypertensive worker with a static hypertension.

One of the most comprehensive studies concerning disability and morbidity in sustained hypertension is to be found in a review by Levy, White, Stroud and Hillman[6] dealing with the primary causes of retirement and death in a group of 1,472 army officers who had a sustained hypertension for a number of years. Of these, 555 were retired for cardiovascular-renal diseases, and 108 died from a variety of cardiovascular and renal complications. Coronary artery disease accounted for nearly 45% and cerebral arteriosclerosis for about 20% of the fatalities. Congestive failure occurred in approximately 10% and chronic nephritis in a somewhat smaller number.

The more advanced complications of hypertensive vascular disease are associated as a rule with a poorer prognosis. Essential hypertension with static blood pressures, particularly with lower basal diastolic pressures, and freedom from complications until relatively late in its course has the most favorable prognosis. But it is recognized that serious complications can occur even in relatively benign hypertension.

Problems in Evaluation of Hypertension

MOST of the factors indicating poor prognosis are easily identified such as progressive rise in diastolic blood pressure, severe retinitis, angina pectoris, coronary thrombosis, congestive

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heart failure and uremia. An outstanding problem in evaluating the hypertensive state, particularly in essential hypertension, is the inability to detect the factors which indicate the likelihood of an impending cerebral vascular accident or an acute coronary thrombosis. It is impossible to foretell a cerebral accident and experience indicates that no particular prognostic significance can be attached to the presence of isolated hemorrhages and exudate in the optic fundi. We are not aware of any work correlating severe retinitis with cerebral vascular complications.

The difficulty in diagnosing asymptomatic coronary artery disease, which can lead to an unheralded cardiac catastrophe, is accentuated by the fact that physical examination of the heart, x-ray and electrocardiogram may be entirely normal in such cases. We realize that the value of the exercise electrocardiogram test remains to be settled, and we appreciate the shortcomings of the test in that occasionally a coronary thrombosis can occur even in the presence of a normal double exercise test as outlined by the method of Master.[7] But we consider it a valuable clinical tool when used to augment the clinical examination and in such circumstances we are inclined to recommend physical restrictions when there is an abnormal response to the double standard exercise electrocardiogram test in essential hypertension. Our criteria[8] are somewhat more stringent than those of Dr. Master because our experience with the test is more recent and the role of the electrocardiogram exercise test in uncovering latent coronary artery disease is still questioned by many competent observers.

A shortcoming of the double exercise electrocardiogram test has been the time needed to conduct this examination; approximately one half hour. In search for a clinical tool which might expedite our procedure we have utilized the portable electromagnetic ballistocardiograph of Dock,[9] because of reports demonstrating a high percentage of abnormal ballistocardiograms in the study of patients with coronary artery disease. Our experience disclosed a high incidence, nearly 85%, of abnormal ballistocardiograms in hypertension. But in the clinical application[10] of the portable ballistocardiograph in essentially normal persons we found the development of an abnormal ballistocardiogram pattern with increasing age, becoming most significant at 45 to 50 years when nearly 40% of tracings were abnormal. At ages 50 to 54 over 60% had an abnormal ballistocardiogram and at 60 years of age nearly 85% of tracings were abnormal. This trend was increased by overweight. Therefore, in the evaluation of the individual case the limitation on the interpretation of the significance of an abnormal ballistocardiogram is due to inability to exclude changes which perhaps are associated with age and increased weight. In addition, technical difficulties with the portable ballistocardiograph can cause abnormal-normal variability in individual cases.

In the apparently normal person with a negative history, normal physical examination and normal electrocardiogram, a normal ballistocardiogram probably indicates the absence of significant coronary artery disease. In such individuals, even with benign essential hypertension, we have not found any abnormal response to the double exercise electrocardiogram test. But, we have seen an occasional case which has recovered from myocardial damage on the electrocardiogram, in whom the ballistocardiogram has also reverted to normal and even an abnormal double exercise test has been replaced by a normal response. Earlier in our work, we felt that a normal ballistocardiogram in the presence of a normal clinical examination and electrocardiogram would serve as a screening measure to exclude hidden coronary artery disease and obviate the necessity for the more time consuming exercise electrocardiogram test. However, the high percentage of abnormal ballistocardiogram tracings with increasing age, especially in the age group of those with essential hypertension, seriously limits the use of the ballistocardiogram in such a screening program.

In the last analysis, the proper evaluation of the hypertensive state requires a complete clinical examination. There are no short cuts to this procedure. In our experience, the history has uncovered symptoms of coronary artery disease as often as any other procedure. This could be expedited if the employee appeared for examination with a short outlined personal history form on which he had previously checked certain important items and also if such basic laboratory data as urine and electrocardiogram were obtained in advance. Physical examination should search carefully for retinitis, aortitis, and evidence of peripheral vascular disease and should include fluoroscopy of the heart and aortic arch. An outlined physical examination form would allow the physician to rapidly list the clinical findings. Using this technique, a complete clinical examination could be accomplished in 30 minutes.

Despite some of its shortcomings, the electrocardiogram is a most valuable clinical tool and the direct writing instruments are very convenient. In the age group over 40 years, any clinical examination without an electrocardiogram is incomplete. A normal ballistocardiogram in the presence of a negative history, normal physical examination aside from hypertension, and normal electrocardiogram will probably rule out latent coronary artery disease. When the ballistocardiogram is abnormal, a more definite conclusion about the status of the heart cannot be made without the aid of the double exercise electrocardiogram test. This, of course, adds to the time and cost of the examination and should be reserved for those cases where the history and clinical signs are suspicious of lat-

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ent coronary artery disease or where hazardous work is undertaken.

Selective Placement

SELECTIVE placement of the worker with hypertensive vascular disease entails the practical application of the clinical findings listed in the evaluation of each case. The resulting profile ordinarily will allow a classification of the case on the criteria outlined in Table I. The employee's age and duration of hypertension will also have to be considered. The industrial physician will find that the more advanced complications of hypertensive vascular disease are more disabling as manifested by a greater percentage of persons working with restriction of physical activity. In a review of hypertensive disease at the Consolidated Edison in 1950, it was found that 50% of cases with hypertensive heart disease required physical restrictions that actually limited their job performance, whereas in the cases with essential hypertension and hypertension with arteriosclerosis, limiting physical restrictions were required in approximately 25%.

Selective placement can be approached either by a general method whereby rather broad recommendations such as "no lifting above so many pounds," "no excessive climbing," etc., are made by the physician, or by a specific method of selective placement,[11] adapting the worker to a specific job. The latter is applicable in those industries where job analysis has been developed to a high degree. Without wishing to enter into controversy on the relative merits of each method, it has been our observation that general recommendations on the part of the physician require good clinical judgment if we are to avoid the risk of seriously limiting the worker, perhaps to the extent that a suitable job cannot be found for him. Experience seems to indicate that even under a general method, the physician learns to apply a relatively specific slant to his general medical recommendations. A successful placement program should allow the utilization of handicapped workers who might otherwise be considered unfit for gainful work.

In most industries the clerical group can usually be excluded from physical restrictions under a selective placement procedure except when they fit into a company program for emergency service such as in the public utilities. To the industrial physician, evaluation of the hypertensive state will be of most importance in the worker engaged in operation of automotive equipment, safety equipment, control valves, manual labor and hazardous physical work.

With a few exceptions, all hypertensive conditions except essential hypertension usually preclude driving vehicles, operating automotive equipment, using safety equipment, performing heavy manual labor or hazardous work. But in essential hypertension we attempt, as much as is possible, to rule out latent coronary insufficiency. While we hesitate to establish a "safe level" for driving, some standardization is necessary for administrative reasons. In essential hypertension without any manifest cardiovascular complication, we feel it safe to drive company vehicles with blood pressure levels up to 180/100. If the level of blood pressure is up to 190/110 the individual may be able to drive passenger cars and light vehicles up to three-quarter ton but should not drive trucks. However, administrative and legal considerations may force severe qualification of this.

Restrictions on manual effort, such as lifting up to 40 or 60 lbs. and repeated stair climbing in the worker with essential hypertension can pose an interesting problem when viewed in relation to restrictions on driving vehicles because under practical circumstances the "safe level" for driving can become involved with the legal bogieman in motor car accidents. Physical effort is directly related to the worker's physical condition and in the case of essential hypertension, with a normal coronary system, under 50 years of age, we are inclined not to impose physical restrictions on ordinary lifting and stair climbing at levels up to 180/100. Essential hypertension with levels over 200/120 may raise questions of working at elevation and responsibility for the safety of others. In the last analysis, the application of physical restrictions in this group will depend on the level of hypertension, and the physician's evaluation of the presence or absence of tissue changes in the various vital organs.

Hypertensive heart disease may be severe enough to be considered totally disabling or the case may be able to work under conditions that markedly limit his expenditure of physical effort. An estimate of the functional capacity of the individual concerned will help the physician in making the recommendations of the amount of physical activity the worker should attempt in order to prevent further cardiac damage.[12]

In malignant hypertension the patient is seriously ill and in all likelihood will become disabled shortly. We have seen several individuals in the early phase of malignant hypertension where successful thoraco-lumbar sympathectomy produced relief of cerebral symptoms although there was only mild sustained improvement in the level of hypertension. These individuals can return to certain types of sedentary work and be gainfully employed. One outstanding case in our experience had complete remission of his entire disease process when sympathectomy was done after a subarachnoid hemorrhage.

In hypertension and arteriosclerosis with systemic symptoms, work restrictions will depend on the complications that may be produced by the lesions in the smaller arteries. The prognosis in cerebral hemorrhage is usually poor. With cerebral thrombosis, the degree of rehabilitation following the original lesion would be a guide to work restrictions but even in the case which makes a relatively complete recovery

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the danger of recurrence will mean restrictions on physical effort, work under tension and perhaps responsibility for the safety of others. The same situation will be met in the case which develops coronary thrombosis. With cardiac enlargement and early myocardial impairment, restriction of physical activity is necessary. The development of renal failure is rare except as part of a terminal episode.

The individual with hypertension and arteriosclerosis without systemic symptoms will require only a few work restrictions in view of the normal heart size and normal electrocardiogram. The presence of the aortic systolic murmur alone, especially with a normal double exercise electrocardiogram test, should not too seriously impair ability to do physical work. At blood pressure levels up to 180/100, moderate physical work may be done. With increasing age and blood pressure levels, further restriction of physical activities may be necessary. This type of case should be able to drive passenger cars and light vehicles up to three-quarter ton. However, caution has to be exercised in such individuals and re-examination should be scheduled every three months. Our caution has been augmented by the fact that in the occasional case that has developed coronary thrombosis after a normal double exercise electrocardiogram test, two out of four such cases (in over 250 cases—but not all hypertensive) had a persistent aortic systolic murmur. One case had transient hypertension and the other a mild hypertension.

In the presence of an abnormal double two step exercise test, the individual with hypertension and an aortic systolic murmur as the only abnormal finding is not permitted to drive even if the control electrocardiogram is normal. These cases should have definite restrictions, even of moderate physical activity. A very practical aspect of this particular type case can place the industrial physician in a dilemma. The individual described above may be excluded from driving a vehicle over a route which he may then have to walk on foot. It would be foolhardy for any one to list any blanket rule to cover this situation. The industrial physician will have to consider these cases on their individual merits against the background of his own experience. He should seek administrative advice concerning specific job requirements, availability of other jobs, and company policy.

It is evident that the development of coronary artery disease or the presence of actual myocardial damage has been the main deterrent to the employment of the hypertensive worker in the driving of vehicles or the handling of other automotive equipment. In a recent correspondence with the *J.A.M.A.*, Falk[13] gives an interesting summary of the employment of bus operators with myocardial damage from the records of the St. Louis Public Service Company. Operators who have recovered from coronary thrombosis with myocardial damage are continued in employment unless there is marked hypertension, evidence of severe myocardial damage on electrocardiogram or in the clinical history, or enlargement of the heart greater than grade 1 or 2. No serious accident has ever resulted from employment of such persons, even with sudden death of a bus or street car operator.

Follow-Up Study

PERIODIC re-evaluation of cases of hypertensive vascular disease should be scheduled at least every six months. When cardiac and cerebral complications are present, a shorter interval is indicated. This follow-up is necessary not only to check on the progression of the hypertensive state but also from the point of view of safety on the job. It is not uncommon to find that with adequate health counselling, which includes weight reduction, regulation of smoking and dietary habits, and a more even attitude toward the problems of everyday living, a hypertensive state may revert to normal. In this instance the individual may be able to return to full duty without physical restrictions and provides the industrial physicians with real satisfaction in a preventive medical program.

Summary

PHYSICIANS are aware that usually it is not the level of blood pressure that determines the course and prognosis in hypertension but rather it is the vascular involvement in target organs that decide the issue. A high diastolic pressure is an exception to this rule. The evaluation of hypertensive vascular disease involves study along two lines: (1) the exclusion of other diseases—renal, endocrine, neurogenic and cardiovascular, that produce an elevated diastolic pressure; (2) the appraisal of vascular involvement in various organs such as the brain, optic fundi, heart and kidney.

This report has outlined a means of clinical study that will allow a practical classification of the various hypertensive conditions and that may assist in the evaluation of the extent of involvement of the cardiovascular system. The necessity of a complete clinical examination, including history, is emphasized.

The factors indicating poor prognosis which can be identified early are a progressive rise in diastolic pressure, severe retinitis, angina pectoris and coronary thrombosis. Congestive heart failure and uremia occur relatively late in the course of the hypertensive state. There is no means of foretelling a cerebral vascular accident. The difficulty in diagnosing asymptomatic coronary artery disease, which can cause unheralded coronary occlusion, is accentuated by the fact that physical examination of the heart, x-ray and electrocardiogram may be entirely normal. The value and limitations of the ballistocardiogram and the exercise electrocardiogram test in such cases have been analyzed.

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A review of the problem of selective placement indicates that a greater number of workers with hypertension can be gainfully utilized in industry, especially the older worker whose hypertension is static and where there is no evidence of serious cardiovascular involvement.

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Breakfast

HOME ECONOMICS teachers in recent surveys in every state report that one out of every five children goes to school with a poor breakfast. Over 60% of the teen-age girls habitually eat a breakfast entirely inadequate for their physical needs. Twice as many older teen-age boys have poor breakfasts when compared to the younger teen-age group. Only 46% of the women in the country and only 56% of the men say they regularly eat a good breakfast. Industrial surveys indicate that the greatest number of accidents occur in the last hour before lunch, and that a majority of the injured have come to work without an adequate breakfast. Corporations have become so concerned over the fact that so many of their young business executives are "cracking up" or consulting their doctors with various complaints that they are instituting medical policies of giving every employee a physical examination at least every 12 months. Many companies are conducting a drive for better eating habits among their personnel. The "Coffee Break" often means that a wagon filled with coffee, milk, fruit juice, breads and muffins circulates throughout the departments to insure a breakfast for everyone. The Department of Physiology and Nutrition at the College of Medicine of the State University of Iowa conducted scientific and controlled tests to study the effects of different breakfast habits on young men and women. They found that the habit of eating a good breakfast every morning results in greater maximum work output, in better maintained mental alertness, and in lessened muscular fatigue during the pre-noon hour. Weight-watchers will be interested to know that young women of 18 to 25 showed little change in weight whether they had no breakfast, only black coffee or ate breakfast supplying 300, 600 or 1,000 calories, along with a free choice of foods and amounts of foods at other meals. Men who skipped breakfast fared worse than the women. They complained more about being hungry. They experienced some dizziness and nausea after strenuous exercise. They were definitely "not on the ball" at work. No breakfast or "light breakfast" habits are likely to have harmful effects. Tests reveal inadequate total food intake, fatigue, lowered efficiency, reduced work capacity, lowered resistance to disease, border-line deficiencies and irritability.

—*New York Herald-Tribune*, September 21, 1952.

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Electromyography and Kinetics of Stimuli in Neuromuscular Disorders

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THE PRESENCE or absence of a nerve lesion, as well as the degree of degeneration or regeneration of the nerve, can be determined accurately by the study of the character of response of a muscle to electrical stimulation and its electrical activity in terms of action potentials observed in the course of electromyography.

Since most of the signs of electrical recovery, based on observations of the rheobase, chronaxie, tetanus ratio, strength duration and strength interval curves and the nature of the electromyographic findings preceed those of motor or sensory clinical recovery, information of diagnostic and prognostic value is obtained from these observations.

Kinetics of Stimuli

THE electrical examination of a neuromuscular unit has its basis in the character of response of nerve and muscle tissue to electrical stimuli. An effective electrical stimulus is one which results in a contraction of a muscle. A muscular contraction occurs when the current intensity of a stimulus measured in milliamperes is strong enough and the duration and interval between stimuli measured in milliseconds is long enough to produce a minimal or maximal contraction.

Galvanic and faradic currents are used for electrical stimulation in neurodiagnostic work. Galvanic current is a steady direct current, the duration of which can be varied from brief to infinitely long duration. A faradic current is an asymmetric alternating current of short duration with short intervals between stimuli.

For accurate electrodiagnostic studies it is desired that the apparatus used in these studies have the following specifications: The galvanic current pulses should have rectangular rather than sine wave forms for accurate determination of their duration and intervals between them (Fig. 1). The desired current strength delivered to the muscle should be of a constant value at any given time irrespective of the variability in the degree of electrical impedence present in the human skin.

A normally innervated muscle responds to stimuli of both short and long durations. The response is a rapid lightning-like contraction and represents nerve activity. A denervated muscle responds best to stimuli of long duration. The response is a slow worm-like contraction and represents only muscle activity.

Depending on the strength of current passing through a muscle the response is either that of an unsustained twitch contraction or a sustained tetanic contraction. A tetanic contraction is one which lasts for the whole duration of the stimulus.

The strength of galvanic current required to produce a minimal muscular contraction varies with the duration of the stimulus. With stimuli of short duration greater quantities of current will be required than with those of long duration. Thus by varying the durations of a stimulus on a progressively diminishing logarithmic scale, from those lasting for 500 milliseconds to one millisecond, a value of current will be found for each duration of a stimulus. A curve, representing milliamperes versus milliseconds can be plotted on a logarithmic scale and is known as a Strength Duration Curve (Fig. 2).

A stimulus having a duration of 500 milliseconds is considered to be of "infinite duration" and represents the first point on the Strength Duration Curve. That amount of current which will produce a minimal muscular contraction with stimuli of infinite duration is called the Rheobase.

The Rheobase is somewhat variable and is dependent on the placement of electrodes, distances between them, condition of the skin and thus will vary in a given muscle in the same person from time to time. Its value resides in it being a point of comparison to other points on the strength duration curve. Thus it is de-

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NOTE: Decision to present this diagnostic compilation through the medium of a journal devoted to industrial medicine naturally follows the recognition that these methods are as applicable in industrial medicine as in any other specialty apart from neurology. A single supporting exemplification is adduced. Lead poisoning continually arises in the industries of this country. In this condition neuromuscular injury is characteristic. The procedures here described well may serve the determination of the location, severity, actuality, regeneration rate, and recovery time of such lesions. However, rather than in any chemical intoxication, the ordinary traumas of industry afford more frequent opportunities for the utilization of these procedures. Pollock's description, during World War I, of the pattern of sensory recovery of peripheral nerve lesions was an important contribution to our knowledge of recovery characteristics of these lesions. During World War II he further added to this knowledge through his studies of the electrical characteristics of recovery of these lesions. This he accomplished by adaptation of the rectangular-shaped wave of galvanic current for the study of kinetics of stimuli and the cathode-ray oscilloscope method of recording for electromyographic studies. It is the purpose of this presentation to acquaint the physician in industry with these latter developments, since peripheral nerves are so frequently involved in the soft tissue traumas so common in industrial medicine.—EDITOR.

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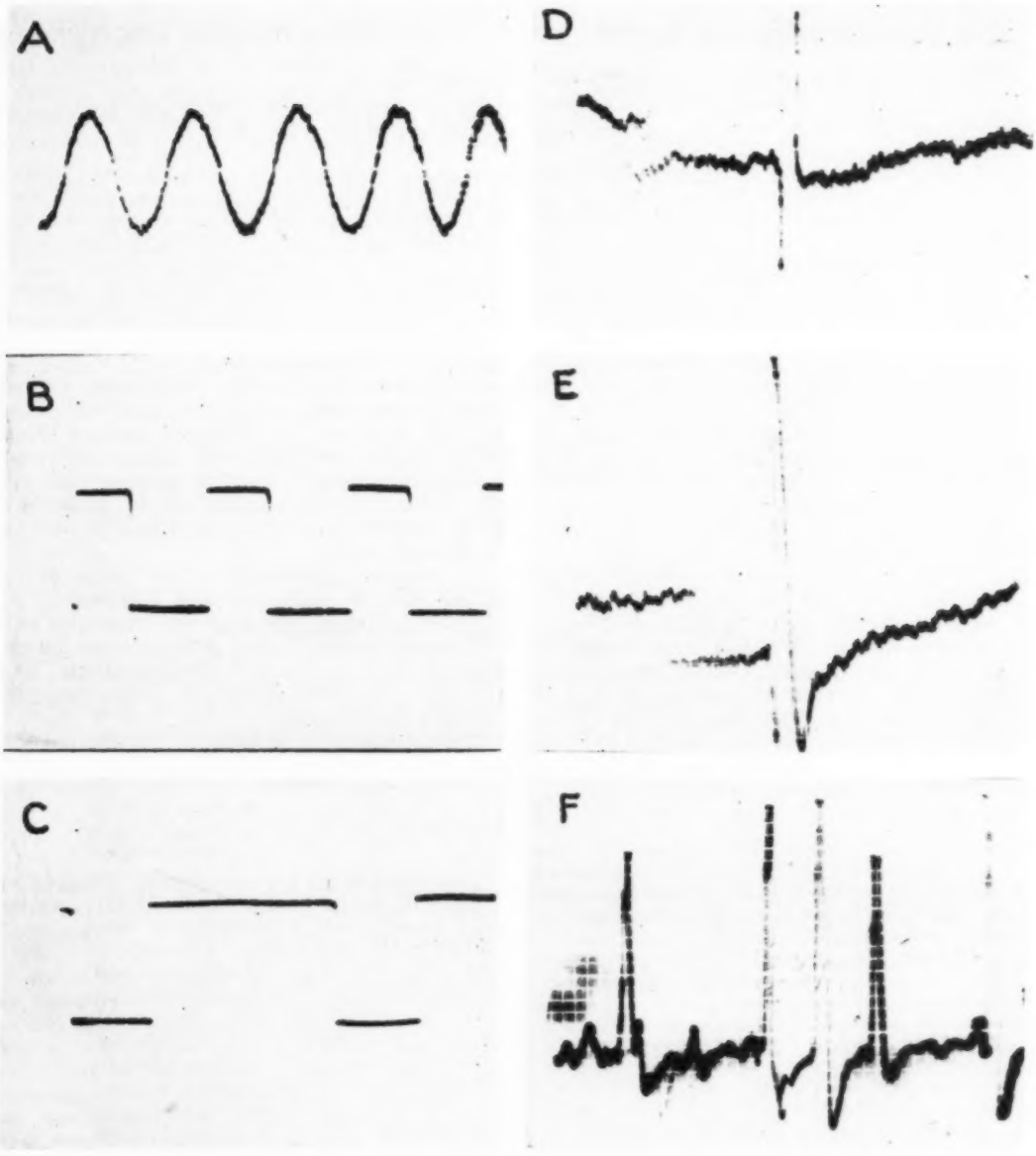

Fig. 1.
Cathode Ray Oscilloscope Photographs

A. Sine shaped wave, 60 cycles. Shown to demonstrate the inadequacy of utilizing this type of a wave in the study of strength and duration of stimuli. The full strength of the stimulus is reached only at the peak of the wave, and therefore not maintained at peak value for the entire duration of the stimulus. There is a time lag between the bottom and the crest of the wave.

B. Rectangular wave. Duration 10 milliseconds. Interval 12 milliseconds. The crest of this type of wave is reached instantaneously and the strength of the stimulus is maintained at peak value for the entire duration of the stimulus.

C. Rectangular Wave. Duration 29 milliseconds. Interval 12 milliseconds.

D. Action potential representing spontaneous fibrillary activity characteristic of a denervated muscle. The amplitude of the action potential is 50 microvolts and its duration two milliseconds. Peripheral nerve lesion.

E. Action potential representing fasciculation of muscle characteristic of irritative lesions of anterior horn cells of the spinal cord or motor cell nuclei in the brain stem. Amplitude 400 microvolts. Duration four milliseconds. Progressive spinal muscular atrophy.

F. Action potentials representing voluntary contraction of a normally innervated muscle. Amplitude 2000 microvolts. Duration four milliseconds.

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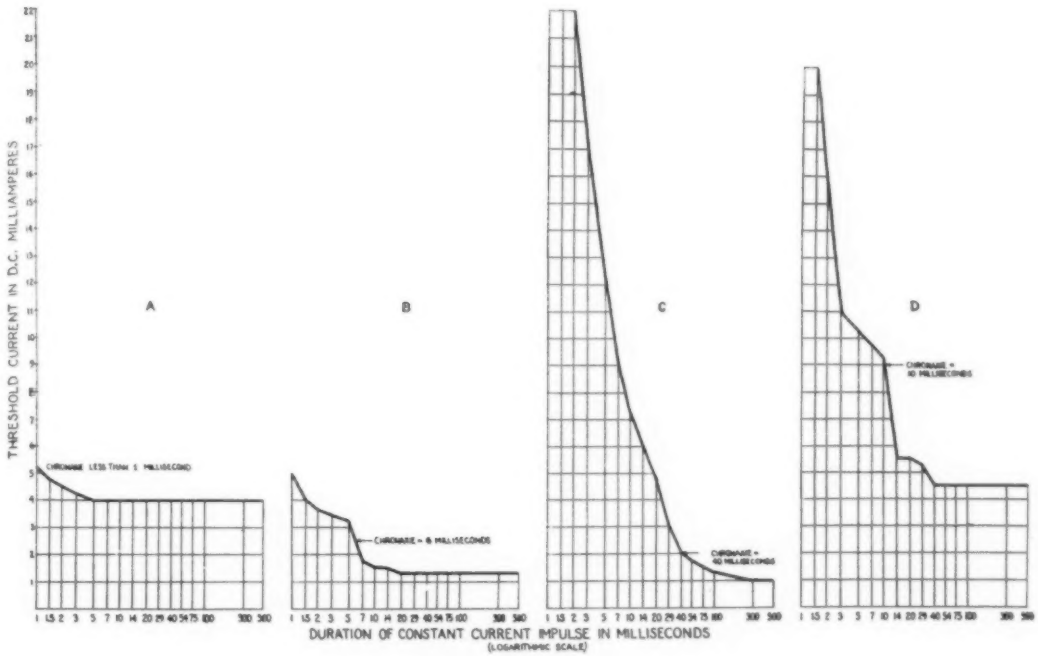

Fig. 2.
Strength Duration Curves

A. Normal innervation. Continuous curve. Rheobase four milliamperes. Chronaxie less than one millisecond.

B. Stage of degeneration of nerve and incomplete denervation of the muscle. Discontinuous curve. Rheobase shows a fall to 1.3 millamperes. Chronaxie is elevated to six milliseconds.

C. Stage of complete denervation of muscle and degeneration of nerve. Continuous curve. Rheobase shows a further fall to one milliampere and the Chronaxie a further rise to 40 milliseconds.

D. Stage of regeneration of nerve and a still incomplete reinnervation of muscle. Discontinuous curve. Rheobase shows a rise to 4.5 milliamperes and the Chronaxie a fall to 10 milliseconds.

sirable to compare some one point on this curve whose milliamperage will bear a constant ratio to that of the Rheobase. Such a point is that duration of the stimulus at which the rheobasic milliamperage must be doubled to produce a minimal muscular contraction and is known as the Chronaxie.

With current values just sufficient to produce a minimal muscular contraction the contraction occurs only following either the establishment or the breaking of the continuity of the electrical current. Passing much stronger currents through the muscle leads to a state of prolonged excitation of the tissues. This results in a more sustained muscular contraction which may be maintained for the whole duration of the stimulus and is then known as Galvanic Tetanus. Since the contraction is visually observed, it is convenient to use a stimulus of long duration for this observation, such as 1500 milliseconds.

The ratio between the amount of current necessary to produce a tetanic and a twitch contraction of a muscle is called the Galvanic Tetanus Ratio.

Another approach to the study of kinetics of stimulus is the information obtained from a Strength Interval Curve. In the strength duration curve the interval between stimuli is allowed to remain constant at 1000 milliseconds while the durations of the stimuli are varied from 500 to one milliseconds. In the strength interval curve the duration of the stimulus remains constant at one millisecond while the intervals between stimuli are varied from one to 12 milliseconds.

Interpretation of Kinetics of Stimuli

RHEOBASE: The value of the rheobase lies not only in its being a point of reference for other portions of the electrical examination such as chronaxie and strength duration curve, but also in its prognostic value in lesions of the lower motor neuron. About three weeks following a lesion, the rheobase drops reaching its lowest level at the time of complete denervation. The response to currents of low amperage values is characteristic of denervated muscle. Reinervation is indicated by a sudden rise in the rheobase. This may be the earliest prognostic sign of nerve regeneration.

STRENGTH DURATION CURVE: Normally the strength duration curve is a somewhat flat continuous curve having a slight slope rising toward that side of the curve representing stimuli of short duration.

At the time of complete denervation the curve

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is also a continuous one but its slope becomes steep in the direction of stimuli of short duration.

During periods of degeneration or regeneration the curve shows discontinuities or kinks in its contour but it still retains a steep slope.

When complete recovery takes place, discontinuities disappear and the curve flattens out.

The discontinuities in the strength duration curve present during degeneration and regeneration are explained by the fact that not all nerve fibers degenerate and regenerate at the same speed. Since the examination tests a muscle bundle which is supplied by several nerve fibers in different stages of degeneration or regeneration, the chronaxie is different for each nerve fiber and these differences in chronaxie are represented by the discontinuities in the strength duration curve. Since in normally innervated muscles all nerve fibers are intact and in a completely denervated one, all are degenerated, the chronaxie is the same for all muscle fibers in the muscle bundle, in both instances, and the strength duration curves therefore show no discontinuities.

The steepness of the slope in the curve is related to the fact that the greater the state of degeneration of a nerve the less is the muscle responsive to electrical stimuli of short duration, so that the current strength necessary to produce a muscular contraction must be greatly increased with stimuli of short durations.

CHRONAXIE: The normal chronaxie of a muscle is less than one millisecond. As degeneration takes place the chronaxie rises and during denervation may become 100 times that of normal. As regeneration takes place the chronaxie diminishes and will approach a normal value on recovery. Where a chronaxie becomes less than 10 m. s., it is a good prognostic sign of recovery.

Normally innervated muscle responds with a contraction to stimuli of one millisecond duration and a current strength of less than the doubled rheobase. Therefore the chronaxie is less than one millisecond. Denervated muscle responds best to stimuli of long duration and when the rheobasic current value is doubled the point of response occurs at stimulus durations greater than one millisecond. At one millisecond the rheobasic current amperage must be more than doubled to produce a muscular contraction.

TETANUS RATIO: A normally innervated muscle responds with a rapid lightning-like response on making or breaking the current. The amount of current necessary to maintain a sustained tetanic contraction for a long time of 1500 milliseconds is three to six times as great as that for a twitch. A denervated muscle responds with a slow worm-like contraction to an electrical stimulus. Because of this slow response the amount of current which produces a twitch contraction, if sustained for a long period such as 1500 m. s., will also keep the muscle in a sustained tetanic contraction and the tetanus ratio is at unity. The tetanus ratio for a denervated muscle is thus at unity and for a normal one at least three to six. A tetanus ratio of one is the most reliable and consistent sign of denervation. When it begins to rise it is a good prognostic sign that nerve regeneration is taking place.

REPETITIVE STIMULI OR STRENGTH INTERVAL CURVE: The Strength Duration Curve clearly demonstrates that larger amounts of current are needed to produce a muscular contraction with stimuli of short than with those of long duration, when the stimuli are spaced far apart.

When stimuli of short duration are passed through the muscle at very short intervals, less current will be needed to produce a muscular contraction. This is so, because each short stimulus, though not effective in itself, leaves behind it, if rapidly repeated, a state of heightened excitability, which summated, facilitates the production of a muscular contraction with less current than would be possible with one short stimulus. Since facilitation is more effective in a normally innervated than in denervated muscle because the former responds more readily to stimuli of short duration, the strength interval curve of a normal muscle is either level or an asymmetrical "U" with an optimum interval point. Increasing the interval between short stimuli diminishes facilitation, so that in a denervated muscle, greater amounts of current are needed when intervals between stimuli are increased. Thus the strength interval curve becomes very steep. The curve ascends during nerve degeneration and flattens out during regeneration, rendering important prognostic information relative to nerve status.

FARADIC CURRENT: Since faradic current consists of pulses of extremely short duration with short intervals between them, the denervated muscle which responds best to stimuli of long duration fails to respond to faradic current in the strength ordinarily used. The current strength needed to produce a muscular contraction is so high and painful that it cannot be utilized clinically. Also, since the return of response to faradism is preceeded by clinical recovery, the prognostic value of faradism is negligible.

POLAR RATIO: A normally innervated muscle contracts more quickly and with less current when stimulated with the cathodal pole (CCC) than with the anodal pole (ACC). During states of denervation the relationship is reversed, that is, the denervated muscle responds better to anodal than it does to cathodal polar stimulation. When regeneration is completed there is a return to normal ratio, CCC being greater than ACC. However, since return to normal polar ratio occurs after return of voluntary motion, the Polar Ratio is of little prognostic value.

Electromyography

VOLTAGE changes expressed as action potentials of a muscle are capable of being amplified and recorded visually on a cathode ray oscillo-

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scope screen and simultaneously be made audible through an audio amplifier. The action potentials observed on the cathode ray screen can be photographed as a permanent record of the examination. These electrical changes are picked up from the muscle, preferably with an intramuscular needle electrode.

A normally innervated skeletal muscle in a completely relaxed state generates no voltage of significant magnitude to be recorded by the electromyograph. The base line on the oscilloscope screen is thus undisturbed and flat and there is silence in the audio amplifier. When voluntarily contracted, this muscle is capable of generating voltages of diphasic character in the range of 500 to 2000 microvolts. The duration of each action potential is from four to eight milliseconds and the frequency varies from five to 30 per second. The audio amplifier registers a characteristic thumping sound.

In instances of muscular denervation due to a lesion of the lower motor neuron, the muscle, so separated from the influence of the nervous system, is not capable of voluntary contraction so that no voltages are generated during attempted voluntary motion. However, the denervated muscle assumes an independent activity in the form of continuous short contractions represented by fibrillary activity. Action potentials representing fibrillary activity are present during seeming rest, the voltages generated ranging from 10 to 70 microvolts. The duration for each fibrillary action potential is from one to two milliseconds and the frequency varies from two to 30 per second. Because of its extremely short duration the fibrillary action potentials produce a sharp clicking sound in the audio amplifier.

During regeneration, in addition to fibrillary action potentials, so called nascent or newborn action potentials may be present. The latter are either unidirectional or alternating having complex polyphasic form. The voltages range from 40 to 600 microvolts each wave lasting from three to 15 milliseconds at a frequency of two to 30 per second. These nascent action potentials are present on voluntary motion only and have a rough sounding tone in the audio amplifier.

Fasciculations of the muscle, which are present in irritative lesions of anterior horn cells of the spinal cord, as in tumors, syringomyelia, muscular atrophies, etc. are represented by single action potentials having amplitudes of about 200 to 500 microvolts and are synchronous with the visible fasciculation of the muscle.

Clinical Examples

IT SOMETIMES happens that only one portion of a given muscle may be denervated, as in instances of nerve compression injuries or lesions of the anterior horn cells of the spinal cord. It is therefore desirable to examine more than one portion of a given muscle.

States of nerve degeneration and regeneration and complete muscular denervation each have their characteristic electrical findings. It is therefore desirable to do successive examinations to determine changes which will occur with time with respect to degeneration, denervation or regeneration. This becomes important in such instances where a severed nerve is sutured following injury. Considering the fact that a nerve grows at an approximate rate of a millimeter a day or an inch a month, one may predict the approximate date of neurotization and maturation, that is, recovery of innervation, with the additional knowledge of the distance of the point of severance of the nerve to its entry into the particular muscle.

Basically the information obtained from the study of kinetics of stimuli and electromyography is related to lesions of the lower motor neuron either in its cell body, in the anterior horns of the spinal cord and in the brain stem; or in the peripheral axon as it courses through the roots, plexuses and peripheral nerves to reach the muscle. Such a lesion may be due to trauma; infections such as poliomyelitis or diphtheria; toxic agents as lead, alcohol and arsenic; degenerative diseases, as progressive muscular atrophy and amyotrophic lateral sclerosis; compression as in tumors and herniated intervertebral discs; and in fractures and dislocations of the spine or extremities.

Impairment of motor power may also be due to causes other than lesions of the lower motor neuron. To mention only a few, one may consider such conditions as lesions of the upper motor neuron as in pyramidal tract involvement; severence of a muscle; arthritis limiting motion by virtue of pain or stiffness about a joint; and disorders of metabolism or deficiency as myasthenia gravis, muscular dystrophies and family periodic paralysis.

The growth of a severed, sutured nerve from the point of suture distally may be totally impeded by interposition of tissue at the suture line of the proximal and distal portions of the nerve. This is readily determined by absence of electrical signs of regeneration on repeated periodic examinations, and constitutes a definitive indication for surgical exploration of the suture line of the nerve. In other instances, when at the expected time voluntary motor recovery is absent but successive electrical studies indicate progressive signs of nerve regeneration, surgical exploration is not indicated since electrical signs of recovery precede those of voluntary motor power.

A diagnosis of a severed muscle rather than a nerve, in such instances as stab wounds accompanied by loss of motor power, is readily ascertained by normal electrical findings. Suturing the severed muscle will usually restore the lost function.

In instances of painful arthritis, motion about a joint may be limited by pain. With prolonged

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disuse, muscular atrophy may take place. That this atrophy is only apparent and not real in the sense that the muscle fibers are innervated and not decreased in number but rather in their volume and bulk, is readily ascertained from the normal findings in the course of an electrical examination.

In instances of impaired motor function resulting from psychological disturbances such as conversion hysteria, or in such states as malingering where, for unwarranted personal gains unjustifiable claims of personal injury are advanced, normal electrical findings will readily ascertain the nature of underlying cause of the apparent impaired motor function.

The symptoms of myasthenia gravis are characterized by muscular weakness not only in response to voluntarily induced muscular activity but that induced by electrical stimulation. These patients show progressively diminishing muscular contractions in response to repetitive stimuli of short duration and to faradism as well as progressively diminishing amplitude of action potentials observed in electromyographic studies. Patients with family periodic paralysis during an acute attack show no response to electrical stimulation, this being known as a cadavaric reaction and is diagnostic of the condition.

Summary

IMPORTANT clinical diagnostic and prognostic information is obtained from electrodiagnostic studies of neuromuscular disorders, with reference to states of nerve degeneration and regeneration, and muscular denervation.

This is obtained from observations of the character of kinetics of stimuli of the muscle in response to electrical stimulation and from electromyography.

The kinetics of stimuli include observations of the Rheobase, Chronaxie, Tetanus Ratio, Strength Duration and Strength Internal Curves.

Electromyography portrays the character of the electrical action potentials of the muscle observed during rest and voluntary motion of the muscle being examined.

(25 E. Washington Street.)

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Gobbledegook

IN HIS book, *The Art of Plain Talk,* Dr. Rudolph Flesch fired the initial round at government "gobbledegook," Washington's almost incomprehensible official language. Now along comes another barrage. This one, entitled "Federal Prose," tells you "how to write in and for Washington." It is authored by James R. Masterson and Wendell Phillips, two Harvard-educated War Department employees. Odd, isn't it, that we should talk so much in one issue about books, especially those written around government activities? If you want to be on your toes when writing to government officials, you might do well to study some of the examples furnished in the book! Should you have occasion to observe that "haste makes waste," you had better change it to: "Precipitation entails negation of economy." Other examples of translations into Federal Prose: "Jack fell down and broke his crown" becomes: "A youth designated only as 'Jack' sustained, incident to loss of equilibrium, a fracture of the cranium." And here's a tough one: "The old gray mare came out of the wilderness 45 years ago." Well, just take a deep breath, for here 'tis: "At a period subsequent to 1905 but prior to 1915 the subject mare, described as anile and in consequence grizzled, issued for motives unknown from a remote region defined only as raw and uninhabited." You can take it from there, but if your letter doesn't click with the boys down in Washington, don't say that we didn't warn you! And we intend to keep on warning you on such silly ideas as expounded in Washington.

—*York Trade Compositor,* quoted in *Pennsylvania Med. J.,* September, 1952.

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Industrial Medicine Goes to Sea

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MARINE industrial medicine had its origin long before the time of Bernardino Ramazzini (1633-1714). In fact as early as the 10th Century, maritime nations recognized the need for rendering medical service to seamen. Consequently, legal codes[1] were established providing such service. These codes are followed throughout all the maritime nations, and many of them date back to the time when France, Spain and England rose to high positions of sea power.

Under Admiralty law, a shipowner is obligated to provide medical care to a seaman who has become sick or injured in the service of his ship, and in the case of outpatient treatment, it has the further obligation to provide the seaman with subsistence. The extent to which the shipowner is liable under existing law for the medical care of his men can best be illustrated by a recent ruling of the U.S. Supreme Court.[2] It was held that a shipowner is responsible to furnish treatment for injuries suffered by a seaman, although those injuries are sustained ashore and not in the shipowner's business, unless it is found that the injuries were caused by wilful misbehavior or vice on the part of the seaman. Whether an act is one of wilful misbehavior or vice is a question of fact for the jury or, in a non-jury case, the judge.

By 1798 the United States recognized the need for special hospitals for the care of merchant seamen and thus established Marine Hospitals for that purpose. This relieved the tremendous burden placed on public hospitals in our larger seaports. During the first century that the Marine Hospitals were in existence, American seamen were required to pay insurance fees to cover the cost of their hospitalization. However, in recent years they are furnished free service at these hospitals and, in addition, foreign seamen may be admitted and receive similar care. In the latter case the shipowner is charged $14.25 for each day of hospitalization. In those ports where no U.S. Public Health Service Hospital is available, marine wards are provided in general hospitals for admission of American seamen on the authorization of the U.S.P.H.S.

Medical service for the officers and men of vessels of the Esso Shipping Company is of special significance when we consider that our Company presently owns and operates 54 ocean-going tankers and has 10 more on long-term bareboat charter. In addition, four more ships of the super-tanker type are under construction. The Company, therefore, is directly concerned with the operation of vessels comprising two million deadweight tons, equivalent to about one-sixteenth of all the tanker tonnage in the world. And it requires the services of over 4,200 officers and men to operate the ships referred to above.

Presented at the Fifth Annual Gulf Coast Regional Conference on Industrial Health, Houston, Texas, September 24, 1952.

The Ship's Medicine Chest

MOST maritime nations provide standards governing the type and quality of medical supplies carried on board ship, and issue general instructions regarding their use. In the United States, the U.S. Public Health Service publishes a manual called "The Ship's Medicine Chest and First Aid at Sea," a guide for shipboard medical treatment on American merchant vessels. The text outlines a standard list of drugs and medical supplies recommended by the U.S. Public Health Service. The shipowner may, of course, enlarge upon these basic recommendations, and such is the case with the Esso Shipping Company. We take pride in having adopted, prior to governmental recommendation, antibiotics which have helped immeasurably in aiding the recovery of our men from various illnesses. Our drug list includes 20 disposable packages of 600,000 units of injectable penicillin. Pyrabenzamine, dramamine and aralen are standard items on our vessels, and recently we have added sterile packages of petrolatum gauze for the treatment of burns.

Medical Service at Sea

THE character of medical service at sea is governed to some extent by the size of the vessel, crew complement, number of passengers, and length of the voyage. Almost every tanker of Esso's U.S. flag fleet carries a Purser/Pharmacist's Mate who renders valuable service in treating our officers and crews. Recently some of our Pharmacist's Mates have received commendation for their services to nearby vessels in distress. In such instances they stood by and treated injured men prior to the arrival of a physician. For example, one incident occurred in the Red Sea when fire broke out on a Greek freighter and several men were burned. The Pharmacist's Mate on one of our vessels cared for six burn cases until a Dutch steamer came alongside and the ship's doctor continued the treatment.

Medical advice by radio to our ships at sea is one of the important functions of our medical staff. An illustration of this was a radio message received from one of our tankers carrying Company employees to Aruba. The message stated that a three-year old girl was suffering from moderate sore throat, a skin rash and two degrees elevation of temperature. The message

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further stated that the child had had measles. The Master and Purser/Pharmacist's Mate and, of course, the child's parents were apprehensive lest the patient might have scarlet fever. They requested medical advice. We radioed for further information and learned that five days previously (two days before departure from New York) the child had received an injection of penicillin because she was suffering from an acute throat infection. We were given the name of the pediatrician on Long Island who had treated her. Both he and our staff felt that the child might be experiencing a penicillin reaction. We therefore radioed instructions regarding use of pyribenzamine to counteract that allergy. We were gratified to receive a radiogram 36 hours later saying the patient was symptom-free, and the rash had disappeared.

In another case a seaman was suffering from symptoms suggesting appendicitis on a vessel enroute to the United Kingdom. We radioed instructions that food be withheld, that penicillin be administered, and that the patient be landed at the nearest port. The seaman was landed at Bermuda 48 hours later, and recovered uneventfully following an emergency appendectomy.

Medical Service in Port

AT THE Port of New York all incoming Company vessels are boarded by one of the Esso Shipping Company physicians as soon as possible after the ship's arrival. The doctor examines all on board whose names are entered on the Ship's Medical Log as having reported any sickness or injury during the voyage.

Frequently diagnostic studies including x-ray and laboratory procedures conducted at our medical offices or the Medical Departments of the local refineries while the vessel is still in port permit us to decide whether the patient requires treatment ashore. If hospitalization is indicated the patients are referred to the U.S. Public Health Service Hospitals.

It cannot be over-emphasized that one of the qualities of the boarding doctor must be that he possess keen diagnostic ability. With more modern ships the turnaround time at the Port of New York may be as little as 12 hours, therefore whatever action is taken by the boarding doctor must be expeditious. The boarding doctor also checks the contents of the medicine chest and approves the requisitioning of medical supplies. In addition, he inspects the sanitary condition of the vessel.

Office Facilities

OUR Company maintains offices fully equipped for diagnostic procedures at 115 Broadway and 5 State Street, New York City. The examination, diagnosis and treatment of sickness and injury cases require a considerable portion of our physicians' time. In some instances cases are referred to the diagnostic unit of the Standard Oil Company (N.J.) at 30 Rockefeller Plaza for further study and, if considered advisable, outside consultants are employed in line with the Company's over-all medical policy. It should be pointed out that claims made by the seamen in cases of injury or illness are far more numerous than among a similar number of shore employees. This is probably due to the very great responsibility placed on the shipowner by the Admiralty Courts. For this reason each case must be handled in a thorough manner in order to render the best possible service and at the same time rule out any unfounded claims.

Particularly at the Port of New York the problem of repatriation of disabled foreign seamen often arises. Our Medical staff evaluates each individual and determines whether emergency treatment is required in the United States or whether the seaman may proceed to his own country for further care. On occasion, foreign seamen who have contracted for service for a period of one or two years, report to the Medical Office at New York alleging various complaints, groundless in nature, vainly hoping that we may certify that they be repatriated before their terms of duty end.

Pre-Placement Physical Examinations

THE number of pre-placement physical examinations performed on seagoing personnel is greater than that in a comparable group of shore employees because of the increased labor turnover among seamen. For the past four years routine chest x-ray studies and serological tests have been an integral part of such examinations. Particular care is exercised to determine which applicant may or may not make a satisfactory psychological adjustment to life at sea.

Periodic Health Inventories

THROUGH office procedures set up for the handling of vacation relief among seamen, it is possible to arrange periodic inventories of officers and men on an annual basis. The medical records are reviewed at intervals of four months, and more frequent examinations are scheduled when indicated. Cooperation between the Personnel Office and the Medical staff is highly satisfactory. At this time I would like to give full credit to the refinery physicians and outport contract physicians whose services are invaluable in assisting us in our examination program and in the prompt and efficient handling of cases of illness and injury, at the various ports.

Venereal Disease Program

THROUGH our efforts in carrying out an intensified program including use of the newer therapies, particularly penicillin, little sickness disability results from venereal disease. Our Company was among the first private shipping companies in the United States to provide its vessels with injectable penicillin. Table I illustrates the low incidence of syphilis among our seagoing personnel. Our rate of 2.6% of posi-

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tive serological findings is encouraging in the light of previous experience and of the rates in surveys in industrial employment ashore.

TABLE I.
SEROLOGICAL FINDINGS

Year	Total Number Serological Tests	Percent Positive
1948	3,795	3.7
1949	3,018	4.2
1950	3,649	2.7
1951	4,392	2.6

Tuberculosis Program

BY PROVIDING our seamen with good working living conditions, a well-balanced diet, and by conducting a rigid chest x-ray program, the incidence of pulmonary tuberculosis compares favorably with that of shore-side industrial workers. Studies conducted by the U.S. Army[3] among inductees in greater New York have shown an incidence of 0.3% significant pulmonary tuberculosis. A chest x-ray survey[4] of 10,000 college students has revealed an active tuberculosis rate of 0.12%. In 20,000 Philadelphia industrial workers[5] 2.5% of possible pulmonary tuberculosis was found, however no mention was made as to what percent of clinically active pulmonary tuberculosis was present in that group. Another industrial survey[6] disclosed 0.18% of clinically active pulmonary tuberculosis among 4,000 industrial workers. In our studies (Table II) we found an incidence of 0.12% active pulmonary tuberculosis in 7,000 chest x-rays of seagoing employees of the Esso fleet.

TABLE II.
CHEST X-RAY—PULMONARY TUBERCULOSIS CASES

Year	Total Number X-rayed	Active TBC	Arrested TBC	Inactive TBC	TBC Activity Undetermined	Total
1948	2497 appl.	3 (0.12%)	8	4	14	29
	1786 empl.	3 (0.16%)	8	9	4	24
1949	303 appl.	0	2	2	1	5
	1536 empl.	4 (0.26%)	8	2	0	14
1950	1135 appl.	1 (0.09%)	6	4	4	15
	1788 empl.	1 (0.05%)	2	3	1	7
1951	1013 appl.	1 (0.09%)	6	4	4	15
	2644 empl.	2 (0.07%)	1	1	2	6
Total	4948 appl.	5 (0.10%)	22	14	23	64
	7754 empl.	10 (0.12%)	19	15	7	51

The above statistics are somewhat encouraging. However, a strong note of warning should be given for all of us to be constantly aware of the possibility of clinical tuberculosis developing within as short a period as two to four months after a survey film has been reported negative. For this reason even a minor complaint of a patient should not be dismissed without a careful physical examination and another chest x-ray.

Preventive Medicine

ONE of the important assignments of our Medical Staff is the carrying out of immunization procedures on seagoing personnel. Each American seaman in our fleet receives a smallpox vaccination. Also a Certificate of Inoculation and Vaccination is issued in each instance. In the case of foreign seamen who sail to the Far East, immunization procedures are much broader.

It is the responsibility of the medical staff to supervise the shipping of drinking water to Aruba from the Port of New York. Problems occasionally arise regarding the quality of drinking water carried on tankers for the use of the ship's crew. Each shipmaster is provided with a list of ports throughout the world where potable water may be obtained if the ship's supply needs to be replenished.

We are fully aware of the importance of good nutrition, and the best of food, and in wide variety, is served on board our ships. For that reason there are no nutritional deficiency diseases among our seagoing personnel.

Also in the field of preventive medicine, with our vessels plying the seas in all climates, many other health precautions are necessary. Special instructions have been issued to the Masters of our vessels regarding the use of sun helmets, salt tablets, insecticides and mosquito netting while sailing in the tropics, and particularly in Near East and Far East waters.

Industrial Hygiene

UNDER the guidance of our industrial hygienists, toxic cargoes such as aromatic tar and xylol are handled with a minimum of risk to crew members. Steps have been taken to reduce the hazard connected with grease solvents for use on generators and electric motors by substituting trichloroethylene for the more toxic carbon tetrachloride. At the present time the Standard Oil Development Company is carrying on further research in this connection.

Summary

THE subject of medical services rendered to the officers and crews of merchant vessels is of increasing importance. Throughout the past 10 centuries legal codes have set forth the medico-legal responsibilities of the shipowner. For that reason, in addition to the desire of progressive management to provide a broad industrial health program for its seagoing personnel, marine industrial medicine has become an integral part of ship operations.

(115 Broadway.)

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Trauma and Peripheral Vascular Disease

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TRAUMA whether it be a strain (overstretched muscles), sprain (wrenched joint or tendons), a dislocation, fracture, open wound, frostbite, burn from electricity, always produces a disturbance of the circulation. The extent and duration of the injury depends on two factors: (1) the character, intensity, and site of the trauma, and (2) the reaction of the injured part to restore function, or the tendency to aggravate a pre-existing disease.

Vascular diseases involve the arteries, veins and lymphatics as well as the heart. In order to evaluate aggravation and presence of pre-existent disease, objective evidence is obtained as follows:

The uninvolved, uninjured extremity is compared to the injured one by determining the character of the peripheral pulses; the skin temperature with a thermocouple (which gives a definite qualitative temperature reading), the postural color changes and reflex dilatation with heat (Landis test). To evaluate, objectively, the arterial inflow and peripheral resistance to the blood flow of the extremities, the oscillometer is of great value. In special cases, x-rays will reveal calcification of the vessels (arteriosclerosis). Its absence is particularly significant in Buerger's disease (thromboangiitis obliterans). The simple, harmless Foley test, using nitroglycerine under the tongue, gr. 1/150, with the oscillometer around the extremity, will reveal increases of oscillations when spasm exists and less when the arteries are blocked by arteriosclerosis.

By such an examination, the physician may be able to answer a number of questions: Is the peripheral vascular status of the patient who was injured, normal or abnormal in the affected and unaffected extremity? What was the effect of the trauma on his peripheral circulation? Has a pre-existent vascular disease which is evident in the injured and uninjured extremity, been aggravated? And finally, questions which cannot always be answered after a single examination: Is the impairment of the circulation permanent and stationary, is it capable of improvement or recovery, or is its progress inevitable?

Trauma and Normal Arteries

AN ARTERY can be crushed, torn apart, partially split, or only contused. It must be remembered that an artery has a strong muscular, elastic wall and thus, in order to produce circulatory changes, there must be severe injury. The normal response to a crushing injury of an artery is a strong contraction which closes the vessel, and a clot forms. By way of example, a 38 year old Otis elevator repair man got his arm pit caught in the shaft as the elevator was rising. This cut his inner side of his arm, and a few days later the pulses at his wrist were unattainable. With prompt treatment, his circulation returned to normal without gangrene or loss of limb. However, when the interval between the trauma and the appearance of circulatory symptoms exceeds three weeks; and the disease proves to be progressive or present in the uninjured extremity, then the diagnosis of traumatic arteritis cannot be substantiated. In young men, progressive vascular disease suggests thromboangiitis obliterans; in those over 50 years of age, arteriosclerosis. Trauma to an artery does not lead to a progressive vascular disease unless a pre-existent lesion was present.

A massive traumatic thrombosis or hemorrhage following a mild injury calls for a thorough study of the patient's blood status. Besides the red and white cell count and hemoglobin determination, the prothrombin time, bleeding time, platelet count, capillary fragility and liver function tests may reveal the factors producing the hemorrhages or thrombosis, even after slight injury. Patients with polycythemia have a marked tendency to peripheral thrombosis. We recently reported a man who had nine thromboembolic phenomena with polycythemia which resulted in two strokes. We reported another, who had electric burns with polycythemia with repeated thrombi. On the other hand, abnormal bleeding can be due to hemophilia, purpura, liver damage, vitamin C deficiency, hypertension, and toxic capillary reactions. If an abnormal blood status is established, then the trauma could only have aggravated a pre-existing condition.

Trauma and Arterial Hemorrhages

A CLEAN CUT of an artery usually results in massive hemorrhage. This ordinarily results in a closed vessel, unless arterial suture of a large vessel can be performed. By and large, the majority of vascular wounds that we saw in World War II, in Italy and Africa, were sutured, but interestingly enough we had less gangrene than the Germans. (This can be attributed to adequate collateral circulation that is present among the healthy, robust young men who were our soldiers as compared to the older age group in the German Wehrmacht.) Seg-

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mental arterial grafts today are the treatment of choice for these injuries. Generally speaking, ligation or thrombosis of major arteries of the upper extremities seldom produces gangrene. In the lower extremity, section or occlusion of the femoral artery high in the thigh (above the profunda) is especially dangerous. Whether gangrene develops, depends on: (1) adequate cardiac function, or (2) the extent of the vascular spasm in the collaterals (which must be intensively treated after a vascular occlusion by blocking the sympathetics, sedatives and sympatholytic drugs (Etamon, Priscoline,[1] Depropanex,[2] Roniacol[3]).

Trauma and Aneurisms[4]

IN THE war, gun-shot and shrapnel wounds when they knicked the edge of the artery, caused a weak point, as one sees when the inner tube of a tire bulges.

In civilian life, we occasionally see them following "auto bumper fractures" to the popliteal space (popliteal artery aneurisms), and stab wounds of the temporal and other arteries. Arterio-venous anastomoses or fistulae may be congenital. This reminds me of a nurse who claimed she had a compensable, occupational disease. She worked in the operating room handing instruments to the doctors. She started to note weakness in her hands associated with numbness, tingling and coldness in her fingers. Later she started to drop instruments, and lost her job. On examination, bruits were found in the forearm. She was submitted to an operation and 100 arteriovenous, congenital communications were found and tied off.

These congenital conditions are not causally related to or aggravated by effort at work. Other types of aneurisms which are not related to or aggravated by trauma are luetic, arteriosclerotic and mycotic aneurisms. Two weeks ago, I saw a mycotic aneurism develop in the femoral artery due to sub-acute bacterial endocarditis. These are always infectious in origin, owing to the bacteria burrowing into the blood vessel wall and weakening it. Then, spontaneously, they may blow out. A similar mechanism occurs with the syphilitic and arteriosclerotic types, the latter of which, is the most commonly seen. Aneurisms, arteriovenous communications and fistulas, if large, cause a drain on the heart, with eventual production of heart enlargement and hypertension, and possibly heart failure and death. Also, they can rupture, produce massive hemorrhage, occlusion of a major artery, gangrene, and result in the amputation of a limb.

Trauma and Buerger's Disease[5]

THROMBOANGIITIS obliterans is a chronic disease of the arteries and the veins which has a tendency to block both types of blood vessels. It usually develops below the age of 40. It is more common in men, but I have seen 10 women with it. It is always aggravated by smoking, but is not caused by smoking. The cause of the disease is unknown. Its course is slow but steady, with spontaneous development of phlebitis in 40% of the cases. The phlebitis may be migrating and recurrent with remissions. It may involve many arterial segments in the four extremities with resultant ulceration of the toes or fingers, gangrene, and amputation of one or more limbs. The prognosis in each individual case is difficult. A rare acute form may lead to gangrene and ascending thrombosis in a few weeks.

The usual chronic case has a gradual onset of intermittent claudication, cramps in the calves on walking, requiring rest before walking again, then the development of cold feet, numbness and tingling, a red foot on hanging off the edge of the bed. This type may have remissions of pain and symptoms and later exacerbations.

There are cases which have healed. As a result of treatment adequate collateral circulation may be developed and the inflammatory reaction about the veins subside. Thus, the effect of trauma on such a disease must be examined from the view of reactivating a slumbering process, activation of a latent infection, or injury to an abnormally vulnerable vascular tree.

This calls to mind a large number of cases that I have seen these last 20 years. The conclusion that trauma has had an accelerating influence on Buerger's disease must be based on:

1. Evidence of pre-existing disease (not the patient's denial of symptoms).
2. Proof of trauma of some severity, followed by symptoms in less than two weeks.
3. Sudden aggravation of symptoms proved by objective evidence.

Buerger's disease can never be caused by trauma; it can only be aggravated by it. The treatment of Buerger's disease in 1952 is recognized as mostly medical; surgical attempts in the past, have not altered the course of the disease, although sympathectomy is often helpful.

Frostbite and Buerger's Disease[6]

PROLONGED exposure to cold produces first a vessel spasm, which is followed by a decreased reactivity of the vessel wall. More intense changes are evidenced by endothelial proliferations, thrombosis, and adventitial reactions. It has been emphasized, that the histological picture of a vessel exposed to prolonged cold, and the picture of Buerger's disease are indistinguishable. The vessel wall reacts almost similarly to any form of trauma, be it mechanical, thermal, electric, or infectious. Therefore, the decision as to whether one is dealing with a traumatic arteritis, a frostbite, or thromboangiitis does not rest exclusively on a biopsy of a vessel.

The conditions conducive to injuries by cold have been carefully analyzed and evaluated. That a patient suffering from manifest or latent Buerger's disease is increasingly sen-

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sitive to cold is obvious; his tendency to vessel spasm is accentuated by cold; his collateral reserve is smaller than normal. Because of the slow, insidious course of the vascular obliteration in some cases of Buerger's disease, it may be conceded that subjective symptoms may become manifest only after exposure to cold, so that the patient really believes that the exposure is the cause of his vascular disease. However, if such a patient's peripheral vascular status is carefully examined, the following points may help to ascertain that a pre-existing vascular disease has been aggravated:

1. There may be evidence of vascular occlusion in other extremities than the one exposed to cold.

2. The exposed toes or foot may be pallid, cyanotic, or gangrenous, but the vascular occlusion may continue to ascend involving higher segments. (This is difficult to explain on the basis of a simple exposure to cold.

3. Evidence of coronary or cerebral or mesenteric involvement may be found, which again is difficult to explain as due to a single frostbite.

As in the case of mechanical trauma, Buerger's disease and arteriosclerosis are aggravated by frostbite through three related mechanisms—the production of vessel spasms, injury to collaterals, and the production of thrombosis in the minute vessels that are abnormally vulnerable or harbor some low-grade infection. Since the extremity affected by Buerger's disease is not in full possession of the defensive mechanism which successfully combats the effect of frostbite, vascular decompensation, which may lead to gangrene, results more readily than in the extremity with normal circulation.

Experiences in the World War II have shown that dry cold weather, in the absence of wind, is less apt to cause frost gangrene than prolonged exposure to moist cold, when the shoes and stockings become soaking wet and the dissipation of heat is increased, as, for instance, in soldiers standing for hours in melting snow. The decisive difference between a true frostbite and Buerger's disease aggravated by frostbite is that the frost gangrene follows immediately after exposure, whereas, in the case of endarteritis, remissions and exacerbations are frequently observed long after the exposure to cold.

The difficulty of making a decision is illustrated in the case of a soldier, who had been exposed to cold during the war and had lost his leg at midthigh. A causal relationship between the amputation and the exposure to cold was acknowledged. Six years later, circulatory disturbances became manifest in the other leg, which also was amputated for a typical endarteritis obliterans.

An expert then declared that the original opinion regarding liability was erroneous, since the patient had never claimed nor proved that the second leg had been frostbitten. Obviously, this was a case of progressive Buerger's disease, accelerated by exposure to cold.

Trauma and Peripheral Arteriosclerosis

A GREAT DEAL of important information concerning this subject has been gathered in the monograph edited by Cowdry.[7] It can be stated with emphasis that a single trauma or a severe strain is not responsible for the development of an arteriosclerotic occlusion. The aggravation or precipitation of symptoms of a pre-existing arteriosclerosis may be admitted under circumstances which tend to show that:

1. Obliterating arteriosclerosis was present and demonstrable at the time of the injury; if such evidence is lacking, the widespread distribution of arteriosclerosis in the non-injured extremities permits the conclusion that the degenerative process had existed in the injured extremity also.

2. The aggravation of the disease was not due to the natural course of arteriosclerosis, but it was definitely accelerated by the injury.

This second point is the most important in forming an opinion; it may be obvious in some cases, questionable in some, and flatly denied in others. The progress of peripheral arteriosclerosis toward gangrene may take two courses. In one, the compensatory collateral channels, which develop with the gradual obliteration of the main vessels may slowly be exhausted, so that the affected limb is on the verge of vascular decompensation. This decompensation may be brought about by a sudden demand for increased blood supply, such as occurs after muscular effort, exposure to cold, slight trauma, or slight infection. The stubbing of a toe, the trimming of a callus, an insignificant blister may cause decompensation and result in gangrene. This is only an incidental last event, "the last straw" in the course of obliterating arteriosclerosis.

In order to demonstrate a causal relationship between such mild trauma and gangrene, the consultant must show that gangrene and, perhaps, loss of the extremity were not expected at that stage of the disease, and that the course of the disease was accelerated by the injury.

If the injury is serious, however, such as a severe contusion of an affected extremity, or a fracture in a patient whose arteriosclerosis seems fairly well compensated, then the subsequent gangrene can be unequivocally attributed to the injury, which exhausted the collateral reserve and thus caused the precipitation of arteriosclerotic gangrene in the injured extremity. The gangrene must follow not later than two weeks after the injury, or a non-healing wound must appear within that time, and gangrene gradually supervenes. In a narrow, rigid, medium-sized vessel, an acute thrombosis may produce gangrene, unless the collateral reserve is adequate. As the collateral reserve is notoriously poor in arteriosclerosis, a number of arteriosclerotics develop a sudden gangrene from an acute thrombotic occlusion. In such cases, a severe trauma may be considered to be the precipitating factor in the development of the thrombosis especially

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if, on microscopic section, a recent thrombus or an intramural hematoma is found superimposed on older mural thrombi and vascular degenerative changes.

Another type of single trauma, a single exposure to cold, may aggravate a pre-existing arteriosclerotic occlusion. It must be emphasized, however, that exposure to cold acts primarily by producing a widespread vessel spasm and that such spastic insults are relatively harmless in the arteriosclerotic individual. To consider that the cold had a precipitating effect on an arteriosclerotic occlusion, evidence must show:

1. That the pre-existing disease was fairly compensated, permitting the injured person to walk for several blocks without pain.
2. That the exposure to cold was definite and verified by weather reports.
3. That within a few days, but not later than two weeks after the exposure, an ulcer or a necrosis of the exposed limb developed.

To help determine the relationship of trauma to obliterating arteriosclerosis of the extremities, only certain general principles can be laid down. Every case must be judged on its individual merits. Proof of a severe injury in a patient who has had enough collateral reserve to have been able to get around and walk, followed within no more than two weeks by a sudden aggravation of the circulatory status with a resultant threatened or manifest gangrene, is acceptable as evidence of an aggravation of a pre-existing disease. A mild, incidental injury, however, which is followed after a lapse of weeks or months, by an aggravation of the disease, cannot be held responsible for the aggravation, since the disease itself tends to become progressively worse. Between these two extremes, a number of cases may fall. Granting that the peripheral vascular status of the patient is known at the time of the injury, and that the injury itself is definitely established, there still may remain reasonable doubt as to what the natural course of events would have been. This may be influenced by many factors, such as intercurrent infections and climatic conditions.

Trauma and Diabetic Endarteritis

DIABETIC vascular occlusion is primarily on an arteriosclerotic basis, appearing, however, a decade earlier than in the non-diabetic group. Occlusion of the smaller arteries and arterioles seems to be the most frequent type and large areas of skin may become gangrenous as a result of a cutaneous infarct, while the larger vessels may remain patent. This arteriolar type of obstruction is one of the unfavorable factors which prevent a normal response to trauma, and hinder repair of the injured diabetic extremity. The collateral reserve in arteriolar obstruction is not only low but is also difficult to develop. The factors which increase the hazards of trauma in diabetic vascular occlusion are the poor resistance of the diabetic to infection and the definite tendency to necrosis. In an adequately controlled diabetic the tissues may heal normally. A number of diabetics at the time of injury, however, are either inadequately controlled, or have suddenly lost some of their tolerance because of the injury and are temporarily out of control. It is common knowledge that a slight abrasion of a toe, or the application of strong antiseptics to a cut, or a ringworm infection is enough to start a gangrenous process, which rapidly invades the bone and forms pockets under the plantar fascia. In such cases, the pre-existing disease itself, and not the mild trauma, should be held responsible for the onset of the gangrene. Only a sudden aggravation of the pre-existing disease, after an unusual trauma, can be attributed to injury.

Trauma and Angiospastic Disturbances[6]

A GREAT variety of neurogenic, endocrine, infectious and toxic factors may produce continuous or intermittent vessel spasm. Hunt believes that true Raynaud's disease is exceedingly rare, but that the Raynaud phenomenon (intermittent symmetrical spasm of the digital vessels) occurs in a wide variety of conditions: after a prolonged exposure to cold, after use of vibrating tools, in hereditary cold fingers, in sclerodactylia, infectious disease, blood dyscrasias, lupus erythematosus, chronic arsenical poisoning, and many others. Only when these conditions, together with vascular disorders, such as thromboangiitis obliterans, arteriosclerosis, syphilitic and rheumatic arteritis, cervical rib, and the scalenus syndrome, are excluded, can the diagnosis of true Raynaud's disease be made. A single trauma may bring out a series of reflex phenomena, in which vessel spasms play a prominent part. But Raynaud's disease, which is due to a symmetrical vessel spasm, cannot be caused by trauma. In this condition, the cause of the spasm is central in origin, at least in certain cases, though the vessels become increasingly susceptible to external insults. If trauma is followed by angiospastic disturbances, they should not be confused with Raynaud's disease. Thus, in one case, a scar in the neck, irritating the sympathetic outflow to the arm, caused a unilateral vessel spasm in the homolateral extremity. In this patient, afflicted with retinitis pigmentosa, a resection of the stellate ganglion was attempted. The cervical sympathetic chain was removed, together with the intermediate ganglion, but missing the stellate ganglion. Six weeks later, the patient developed a sensitivity to cold and angiospasms, with attacks of pallor, followed by cyanosis of the hand. At re-operation, the stellate ganglion was found imbedded in heavy scar tissue. The excision of the ganglion promptly relieved the vasomotor phenomena. The diagnosis of Raynaud's disease is insupportable in this case. If there had been a pre-existing disease in this middle-aged male, it was most likely Buerger's disease. It is improbable that a nor-

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mal vascular tree would have reacted so poorly to the injury, especially in the extremity. Granting, then, that a pre-existing vascular disease was present, the rapid aggravation following the trauma is obvious and causal relationship must be acknowledged.

Conclusions

IT IS impossible to discuss here all the hazards of industrial life with reference to their effects on the workers' peripheral vascular systems. An effort has been made to present approaches to the problems of causal relationship and aggravation encountered in our experience, and to provide a suggestive guide to physicians who may be faced with similar situations in their own patients or in workers in industry.

(44 West 55th St.)

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Clinical Statistics

HILL makes the observation that clinicians subconsciously use statistical methods although they sometimes reject statisticians and all their works. They state that because human beings possess inherent differences and are not alike, as bricks, they do not lend themselves to statistical method. Yet when confronted by a given type of case these clinicians will use treatment they had found previously to be effective in case or cases with similar characteristics. Fundamentally, this is simply the application of prevously obtained statistics. It indicates that human beings commonly react like other human beings, thus are not necessarily completely unique. Dangers in such applications are not missed by the author. He carefully points out that a few such observations, accurate in themselves, may not take into proper consideration the laws of chance. One physician may observe a method of treatment giving brilliant success in three successive cases. Another, equally accurate in his reporting, may use the identical method with three dismal failures. Hill makes the pertinent remark that "the medical journals, euphemistically called the literature, are cluttered up with conflicting claims—each in itself perfectly true of what the doctor saw, and each insufficient to bear the weight of the generalization placed upon it." Hill quickly explodes the stiff theory that you need a hundred cases for statistical worth. He says that if you treat a single case of acute leukemia with a new drug and the patient gets well you have made an observation of great statistical importance. This is based on the simple fact that human beings, unique though they may be, are in some ways just as alike as bricks. In the matter of acute leukemia there is remarkable similarity. They all die. Thus the one case to get well must be recognized by the statistician as of vital importance. On the other hand, if you give a drug to a case of rheumatic fever and the patient gets well you have proved nothing. Some cases do get well without any treatment whatever. This demonstrates the fact that human beings have unique qualities. Their response to rheumatic fever is variable and individual. The statistical method here needs more cases. Thus there is no pat number. Likewise, there should be no pat thinking.

—From an Editorial in *Northwest Med.*, October, 1952, commenting on "The Clinical Trial," by A. BRADFORD HILL, in *New England J. Med.*, July 24, 1952.

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Industrial Physicians in New York State and the Nation

FOR A LONG time industrial medicine has been handicapped by the lack of near-precise information as to the number of salaried physicians, full-time or part-time, serving industry. Membership in various industrial medical associations signally fails to provide such data. Any census of industrial physicians conducted through the medium of questionnaires sent directly to physicians introduces confusion, since all too many style themselves industrial physicians in the absence of significant identification with industrial plants or other definite industrial medical pursuits.

In part this deficiency has been eliminated, at least for one state, through a statistical report* prepared by the Department of Labor of the State of New York. The information there presented represents a project conducted for civil defense authorities.

This questionnaire study as to medical personnel was linked with another inquiry as to feeding facilities in work establishments. The latter activity required the exclusion of such work places as restaurants, hotels, and some hospitals since, in such work places, the feeding of personnel may be routine but not through facilities primarily designed for employees. After the exclusions just mentioned, together with certain others such as railroads and governmental agencies, there remained a sizable group, all with 100 or more employees, and said to provide accuracy not less than 95%. The accrued data led to numerous tabulations, broken down into many segments useful in the objectives of the study. The partitioning of results in turn led to segregation as to New York City and the remainder of the state, manufacturing and non-manufacturing enterprises, durable and non-durable goods, etc. While these statistical arrangements are complex, careful analyses ultimately afford extensive information as to the number and percentages of plants employing full-time and part-time physicians, graduate and non-graduate nurses, and feeding services for employees. It is the purpose of this present review to extract pertinent data exclusively related to the number of plants in New York State employing full-time or part-time physicians and the numbers thereof. Similar recapitulations might be prepared as to nurses, and feeding facilities.

The warrant for attempting to extend the New York figures to the country as a whole might be sharply questioned. Notwithstanding, and in full awareness of statistical pitfalls, effort has been made to project the New York figures on the basis of the U. S. Census of Manufacturers, published in 1950, and the records of Old Age and Survivor's Insurance. At once it will become apparent that discrepancies are inescapable. At best, the national figures provided are an approximation, but possibly an acceptable approximation.

*"Medical Personnel and Employee Feeding Facilities in New York State Establishments Employing 100 or More Workers." Department of Labor. DR. LEONARD GREENBURG, Director of the Division of Industrial Hygiene and Safety Standards, and CHARLES A. PEARCE, Director of the Division of Research and Statistics. Publication B-55, March, 1952.

The New York Study

OFFICIAL questionnaires were sent out (in 1950) by New York's Department of Labor to 6,200 work places utilizing 100 or more employees in the year 1949. After the exclusions above indicated it was determined that 4,468 work places constituted New York's totality of organizations with 100 or more individuals on their payrolls as of October, 1950, within the purposes, limitations, and known errors of this investigation.

Nine-hundred forty seven (21%) of this totality (4,468) reported the payment of salaries to some medical personnel. By "medical personnel" in this instance is meant full-time or part-time physicians, full-time or part-time registered or practical nurses. These figures never embrace medical personnel merely on call, and thus serving on a fee basis.

A total of 2,717 physicians and nurses were employed, thus representing an average of three individuals within the 947 work places employing some medical personnel.

Following is a recapitulation of some New York tables:

TABLE I.
A DISTRIBUTION OF NEW YORK WORK PLACES (100 OR MORE EMPLOYEES) BY SIZE

Total	100-199	200-499	500-999	1000-1999	2000-4999	5000 up
4,468	2,306	1,382	429	215	105	31
100%	51.6%	30.9%	9.6%	4.8%	2.3%	.693%

Plants With Full-Time Physicians

OF NEW YORK'S 4,468 work places with 100 or more employees, only 109 (2.43%) employed full-time physicians. This constitutes 11.5% of those 947 plants providing some salaried medical personnel. No implications arise at this point that all plants with 100 or more employees should supply full-time physicians or would profit thereby. The distribution of these 109 plants by size leads to Table II:

TABLE II.

Total	100-199	200-499	500-999	1000-1999	2000-4999	5000 up
109	8	15	20	19	28	19

The full-time physicians in these 109 plants function under a diversity of circumstances, such as along with other full-time physicians, part-time physicians, and full-time or part-time registered and practical nurses.

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Plants With Part-Time Physicians

TABLE III shows a total of 435 plants served by part-time physicians, but fails to reveal the total number in which part-time physicians are employed, being only the total number in which the part-time physician is the chief plant physician.

TABLE III.

Total	100-199	200-499	500-999	1000-1999	2000-4999	5000 up
435	41	124	109	99	51	11

Number of Full-Time Industrial Physicians in Industry

THUS FAR, the several tables only indicate the number of plants with full-time or part-time physicians. The number of physicians so engaged has not been indicated, since several may have been employed in a single establishment. The next two items deal with numbers of physicians. The records surveyed indicate that the total number of full-time physicians in New York State's 4,468 plants at or above the 100-employee level, is 238, and that the total number of part-time physicians so employed is 723.

One in 11 plants of the 1000-1999 size utilizes the services of one or more full-time physicians. Arbitrarily and debatably assuming that every such plant would profit by the services of a full-time physician, it would appear that in this category there is a shortage of at least 196. Under the plant size category of 2000-4999 workers, the total number of such plants in New York state is 105. The number of such plants employing one or more full-time physicians is 28, the ratio being 1 in 3.7. Again, arbitrarily but with less uncertainty, there is a deficiency of 77 plants without full-time physician's services.

In the State of New York, 31 establishments employ 5000 or more workers within the exclusion originally set forth. Within this number, 19 employ one or more full-time physicians, the ratio being 1 to 1.6. In this instance, there is an implied deficiency of 12 plants that might be expected to rely upon full-time physician's services.

It is somewhat remarkable, but no less admirable, that 43 full-time physicians are employed in those numerous plants below 1000 workers, and eight of these are located in plants below the 200 level. However, on a percentile basis in relation to the total number of such establishments, the figure becomes insignificant.

Industrial Medicine on a National Basis

ON A starkly speculative basis, guarded effort has been undertaken to extend the New York figures to the country as a whole, but with some obvious incongruities. The New York figures derive from the date period of October, 1950. Related figures from the Federal Annual Census of Manufacturers (1952) are not consonant, in that plant size distribution utilizes a somewhat different system. On this account, resort was had to the previous Census of Manufacturers published in 1950, but the data published in that year were collected in 1948.

TABLE IV.
NATIONAL EMPLOYMENT AND TAXABLE PAYROLLS BY INDUSTRY
(Plant Size by Number of Employees)

0-3	1,529,364
4-7	550,428
8-19	350,686
20-49	148,558
50-99	50,395
100-499	38,141
500 up	7,359
Total	2,674,931

Thus from the usable figures of the Federal Census of Manufacturers closest to the period of the New York survey, it appears that the total number of the nation's manufacturing plants, but not including all places of business, with the size from 100 employees upward, is 45,500. Mindful of obvious and precarious uncertainties, the New York ratios were extended by us to this national figure. The result is labeled only as an approximation. By our calculation it would appear that some 2,423 physicians are utilized in industry under circumstances warranting the designation "full-time."

The same procedures yield figures as to part-time salaried industrial physicians throughout the country as 7,281. The ratio between full-time and part-time salaried physicians in industry is almost exactly 1 to 3. The total number of salaried industrial physicians thus becomes 9704. However, this approximation fails to include fair numbers of physicians associated with occupa-

TABLE V.
ESTIMATED NUMBER OF ESTABLISHMENTS WITH FULL-TIME PHYSICIANS AND NUMBER OF FULL-TIME PHYSICIANS EMPLOYED IN THE UNITED STATES[a]

Size of firm and industry group (1)	Total	Establishments with full-time physicians (2) Percent	(3) Number	Full-time physicians (4) Number per Establishment	(5) Number
Total, with 100 or more workers	43,954		1,055		2,245
100-499 workers	36,716		236		409
500 workers and over	7,238		819		1,836
Manufacturing, with 100 or more workers	24,690		703		1,289
100-499 workers	19,881	.53	105	1.17	123
500 workers and over	4,809	12.44	598	1.95	1,166
Non-manufacturing, with 100 or more workers	19,264		352		956
100-499 workers	16,835	.78	131	2.18	286
500 workers and over	2,429	9.09	221	3.03	670

a. Excludes restaurants, hotels, and hospitals which were omitted from New York State study.
1. Derived from data given in "County Business Patterns, First Quarter 1948," compiled by the Bureau of Old-Age and Survivors Insurance.
2. Derived from New York State data.
3. United States total number of establishments (column 1) multiplied by New York State percentages (column 2).
4. Derived from New York State data.
5. United States establishments with full-time physicians (column 3) multiplied by number of full-time physicians per establishment (column 4).

tional health who serve in teaching positions in universities, field and administrative positions in public health departments, and in insurance companies. Thus, the estimates provided may err toward conservatism rather than extravagance.

The New York compilers, even more aware of statistical pitfalls, and unenthusiastic about this form of extrapolation, provided for our use a similar calculation making use of the nation's figures as to plant size, by number of employees as obtained from the Bureau of Old Age and Survivors Insurance. Their compilation constitutes our Table V.

This approach suggests the approximate number of full-time physicians in the country to be 2,245. The 178 difference between the two methods of calculation is not disturbing to this rough estimate. It is recognized that neither figure represents exactness.

Summary

UNTIL substantial figures are available for the country as a whole as to the number of physicians employed in industry, some significance may be attached to the approximation based upon the extrapolation of the data furnished in the report of New York State's Department of Labor on medical personnel for that one state. This procedure suggests that in the country as a whole there are approximately 2,423 full-time physicians in industry and 7,281 part-time salaried physicians. The suggested total number of salaried physicians in industry becomes 9,704.

Through another method of speculative calculation it develops that the total number of full-time physicians in the nation's industry is 2,245. Accordingly, on this basis the total number of part-time salaried physicians and the total of all physicians in industry would be slightly less than the number first mentioned. With the addition of those physicians in industrial health serving in teaching capacities in universities and those others identified with public health departments and insurance companies, it becomes possible to believe that an approximation of 2,500 is justified as the estimate of full-time industrial physicians in the country.

Stress

WHAT is stress? What are "stressor agents"? Selye catalogues them as follows: trauma, bleeding, burns, heat, cold, x-rays and other ionizing radiations, sunlight, electricity, nervous stimuli, exercise, rest (!), anoxia and asphyxia, infections, anaphylactic reactions, drugs and other poisons, hormones, and diet. The common denominator of all these is that they are potentially harmful, even lethal, to their victim; and if he is to survive a severe exposure to any of them, he must react defensively against them. The mechanism of this reaction has been described and defined by Selye under the names of the alarm reaction and the general adaptation syndrome. These consist in barest essence of increased pituitary secretion of corticotropin (the adrenocorticotropic hormone, or ACTH), which causes the adrenal cortices to secrete increased amounts of the several adrenal cortical steroid hormones; these in turn act on the peripheral tissues to help them defend the whole organism against the enemy. It is when this defensive response is inadequate, excessive, or abnormal, that the "stress diseases"—the rheumatoid group, the "collagen" group, the allergic-psychogenic disturbances, hypertension, peptic ulcers, and so forth—are produced. The concept is still incompletely developed, obscure in many areas, and beset with contradictions; yet it has already proved to be an extremely useful one in both theory and practice, as we all know. —HARRY L. ARNOLD, JR., in *Hawaii M. J.*, quoted in *West Virginia M. J.*, October, 1952.

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The Seventh Saranac Symposium

— September 22 to September 26, 1952 —

Saranac Lake, New York

SOME 200 persons assembled at Saranac Lake, on the dates indicated, for the purposes of a re-examination and current appraisal of the dusty lung diseases. This group embraced physicians, hygienists, teachers, insurance executives, industrialists, attorneys and compensation officials. All arrived in the sunshine of eager expectancy. At the end of the period, some departed in the raininess of enlightened confusion.

The faculty, which was much larger than the staff of the Saranac Laboratories, included scientific notables from other countries. Some of the participants contributing scheduled presentations were:

E. R. A. MEREWETHER, M.D., H. M. Senior Medical Inspector of Factories, Ministry of Labour and National Service, London. England.

CHARLES M. FLETCHER, M.D., Director, Pneumoconiosis Research Unit, The Medical Research Council, Llandough Hospital, Cardiff, Wales.

PHILIP HUGH-JONES, M.D., Senior Lecturer in Medicine, University College of The West Indies, Mona St. Andrews, Jamaica, B.W.I.

B. E. KUECHLE, Vice-President and Claims Manager, Employers Mutual Liability Insurance Company of Wisconsin, Wausau, Wisconsin.

ARTHUR J. VORWALD, M.D., Director, The Trudeau Foundation and the Saranac Laboratory, Saranac Lake, New York.

GEORGE W. WRIGHT, M.D., Head, Department of Physiology, The Trudeau Foundation, Saranac Lake, New York.

THEODORE C. WATERS, Counsel to Industrial Hygiene Foundation, Industrial Counsel, Mullikin, Stockbridge and Waters, Baltimore.

FRANCIS B. TRUDEAU, M.D., President, Board of Trustees of the Trudeau Corporation, Saranac Lake, New York.

A. J. ORENSTEIN, M.D., Chief Medical Officer, Rand Mines, Ltd., Johannesburg, Union of South Africa.

C. G. SHAVER, M.D., Superintendent, Niagara Peninsula Sanatorium, St. Catherines, Ontario, Canada.

WILLIAM S. MCCANN, M.D., Professor of Medicine, University of Rochester, Rochester, New York.

ANTHONY J. LANZA, M.D., Chairman, Institute of Industrial Medicine, New York University, Bellevue Medical Center, New York.

ANY scientific matter that lends itself to precise and accepted definition is said no longer to provide any problems. On that premise the pneumoconioses are gifted as problem makers, since utterly they defied definition at Saranac. The term "pneumoconiosis" was vilified, and the word "benign" before "pneumoconiosis" was tossed out of the window as reeking with infamy. It was shocking to some attendants faithful to many previous symposia, that 18 years after the first symposium and 58 years after the inauguration of the Saranac Laboratories, an outside committee consisting of DRS. SEWARD MILLER and CARL PETERSON should be designated to provide or procure in due time a definition of the "pneumoconioses." No platform dismay was manifest when one speaker pontifically announced in lieu of a definition that when the first particle of inhaled dust is engulfed by the nearest phagocyte, a pneumoconiosis is inaugurated. Of course, that means that every living person older than 30 minutes becomes a lifelong victim.

Even so, perhaps no definition of "pneumoconioses" or "silicosis" is preferable to that one promulgated (1952) in the "Report of the Commission of Enquiry into the Functions of the Silicosis Medical Bureau and the Silicosis Board of Appeal." One of that South African board's members responsible for the entire record was active in the recent Saranac symposium. The absurd definition there appearing is: " 'Silicosis' for the purposes of this Act means any form of 'pneumoconiosis' which, for the purposes of this Act, shall mean a diagnosable disease of the respiratory organs caused by the inhalation of mineral dust . . . ." It is incredible that the magnificent contribution in the long past years from the South African group should disintegrate into this legalized nothingness.

The gleefulness and apparent intellectual satisfaction attending the confession that no acceptable definitions as to the "pneumoconioses" could be devised, then and there tipped off, in the first program item, the week's prospects. The iconoclasts, well seated in their English saddles, rode herd on every substantial tradition built up around the pneumoconioses. Only a dusty nakedness survived.

The next of several victims? The nuisance dusts. In the halcyonic years lately abruptly terminated there were innocent dusts, inactive dusts, nuisance dusts, dusts which at most induced only benign pneumoconioses. Now their innocence has disappeared. Coal dust, long belabored merely as pestiferous, has attained to high estate in dust pathology. Aluminum, graphite, iron were allocated spots on the definite offender list, while tungsten and cobalt, little mentioned, are but presently suspect. Focal emphysema is the manifest troublemaker in such pneumoconioses and the prime contributor to disability. No implication whatever would justi-

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Left to right: A. J. Gentholts, Assistant Counsel, Republic Steel Corporation, Cleveland; Martin F. Hilfinger, President, Associated Industries of New York, Buffalo; Theodore C. Waters, Counsel, Industrial Hygiene Foundation, Industrial Counsel, Mullikin, Stockbridge and Waters, Baltimore; Andrew Kalmykow, Assistant Manager, Casualty Department, Association of Casualty and Surety Companies, New York City; James J. Waring, M.D., Professor of Medicine, University of Colorado School of Medicine, Denver; Fernand Gregoire, M.D., Medical Director, Lavoisier Institute, Montreal, Quebec; M. W. Thompson, Treasurer and General Manager, Hall China Company, East Liverpool, Ohio; George W. Wright, M.D., Head, Department of Physiology, Trudeau Foundation, Saranac Lake, New York; E. R. A. Merewether, M.D., H. M. Senior Medical Inspector of Factories, Ministry of Labour and National Service, St. James Square, London; William S. McCann, M.D., Professor of Medicine, University of Rochester, Physician-in-Chief, Strong Memorial Hospital, Rochester, New York; Leonard J. Bristol, M.D., Head, Department of Radiology, Trudeau Foundation, Saranac Lake; D. M. Brumfiel, M.D., Saranac Lake; Jan F. Hampe, M.D., Prosector at The Pathology Laboratory, Wilhelmina Hospital, Netherlands; Arthur J. Vorwald, M.D., Director, Saranac Laboratory and Trudeau Foundation, Saranac Lake; Charles M. Fletcher, M.D., Director, Pneumoconiosis Research Unit, The Medical Research Council, Llandough Hospital, near Penarth, Cardiff, Wales, Senior Lecturer, Postgraduate School of Medicine, University of London.

fy any assumption that any of these quondam innocent dusts, whether coal, graphite, etc., regularly excite disabling states. All that was necessary to wreck the edifice of medical defense in spurious legal claims was the admission and insistence that the erstwhile nuisance dusts "could," or "can," excite, and "have" excited, disabling states. That havoc now has been imposed.

The relentless ones descended upon the chest x-ray film. About all that was left was cellulose acetate. Its essentiality in diagnosis was allocated to disrepute. Some pneumoconioses do not appear in x-ray shadows; wholly negative films may arise in a condition factually totally disabling; significant pathology is reflected in some films far earlier than the appearance of that crucial diagnostic stand-by—the silicotic nodule. Under newer proposals as to x-ray classification, the first stage is, to some, impressive only as "the stage of imagination."

Surely the autopsy table retains its diagnostic sanctity. Not necessarily so. Available to this Symposium were some indications that silicotic nodules arise in fair numbers in a majority of persons never exposed industrially to silica in any of its forms.

By no means was the entire Symposium destructive. The presentation of DR. PHILIP C. PRATT on "New Synthetic Silicas" provided immediate scientific guidance in the utilization of newly devised commercial products. As ever, the pronouncements of DR. GEORGE W. WRIGHT, in his paper "Maximum Ability for Physical Work of Moderate Duration Correlated with Various Tests of Pulmonary Function," carried conviction. More than ever it becomes manifest that the detection of disability in suspected pneumoconioses must hereafter rely upon elaborate lung function determinations such as he described. In truth, lung function tests are about the only procedures that survived the wrackage.

That portion of the program dedicated to the appraisal of the status of occupational pulmonary cancer was constructive if not conclusive. DR. VORWALD'S presentation relative to beryllium

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Busman's Holiday

as a cancerogen left little uncertainty that at least under experimental conditions beryllium may excite neoplastic growth.

As to chromium as a provocator of pulmonary cancer, DR. LANZA provided strong indications that the clinical incidence of pulmonary cancer among chromium workers is higher than expectable. However, thus far the production of pulmonary tumors in animals by chromium has not been achieved beyond debate. In the case of asbestos, the immediate consensus of finding as to the causation of pulmonary cancer is in the negative.

The last day and a half of the Symposium was directed to legal situations referable to the engineering and medical aspects of dusty lung diseases among workers. Chiefly these sessions were staged by officials in the compensation field, attorneys and insurance company representatives. Manifestly impressed by shifting opinions as to the nature and significance of occupational diseases, these compensation workers stressed the desirability of the guidance of medical advisory boards with outstanding professional qualifications, authorized to conduct appraisals of all occupational disease claims but, foremostly, the pneumoconioses. The fact was faced that the effectiveness of medical boards often was hampered through ill defined status as to the legal significance of medical conclusions. It was urged that all medical boards be so constructed that one or all members at any time might be subjected to cross examination by any legal party.

Inescapably compensation boards will become mindful of the stark liberalization of some medical attitudes toward occupational diseases of the lung. Already some members have heard the shoutings of "social justice," but apparently are willing to recognize the employer as a good citizen equally to be considered in the meting of whole justice. Compensation boards, now more than ever before, are faced with endless perplexities in the administration of laws embracing the pneumoconioses when now the long accepted diagnostic criteria have either been challenged or destroyed.

While a few of the despoilers pointedly recorded their disdain for any of the mundane consequences of their high altitude assaults, it is unlikely that industrial operators at the sea level of business may attain to equal unconcern. As a direct consequence of the Saranac Symposium, it is prospective that within the next few years some millions of dollars will be thrust into the undeserving hands of claimants without disabling pneumoconioses.

Happily, the Saranac Laboratories may possess in sequestration a laudable lot of medical defenses suitable to the honorable combating of palpably spurious legal iniquities. If so, early disclosure yet may restore the equanimity of the silent tumult.

"Hi, Doc"

THE small boys of the town were having a Christmas party. The church basement was alive with them, milling, pushing, darting about—shrill voices adding to the general confusion. Many were from the "underprivileged," and this annual event was their high point of the year. Finally, they managed to get settled for supper. A man coming in just then, and looking them over, saw the only negro boy in the group sitting by himself at a big table in the corner. Straight to the table he went, took the chair beside the little negro, and started talking. The black eyes sparkled, a grin spread wide, gave way to laughter, and the youngster beamed and fidgeted with pleasure. This was "Doc" who had come to sit beside him—"DOC" DOBBINS whom everyone knew, and loved. Shortly, the vacant places at the table were filled, and all were enjoying the time of their lives. An incident in the life of a busy physician, but eloquent of the reason why that physician was known as one of the country's outstanding protagonists of the "Hi, Doc" philosophy of industrial medicine.

—From certain biographical material relating to THOMAS DOBBINS, M.D., formerly Medical Director of Servel Inc., Evansville, Indiana.

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A History of the Bayway Refinery Medical Department

THOMAS F. NEVINS, JR., M.D.
Esso Standard Oil Company

WHEN work began on this history, an interesting old book was brought to light. To satisfy our own curiosity, we are still attempting to determine just who maintained its pages. The majority of the entries range from early 1908 to 1909, and cases are listed with an entire page devoted to each. The care given entries made in this ledger puts most of our present record keeping to shame in that the longhand script looks as though it had just been removed from the etching plate.

Besides the record of cases and the background of care given, the ledger even recounts rates for medical services which, in this day of inflated prices, seem ludicrous. For example, hospitalization was available for $1.00 a day. Although horse-drawn, an ambulance was to be had for $2.00 a call. A clinic visit was priced at $1.00. With room, board, and medication included, hospitalization was the same price as a visit to the clinic. This is as it should be. The type of care in the hospitals was certainly not outstanding. To the patient, the doctor's opinion was, and is, worth as much as a day in the hospital.

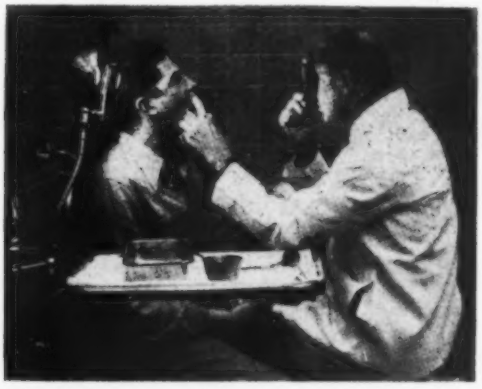
Rounding out the picture, the old book also offers information on the going rates of pay. With each patient's name is listed his occupation and his wage. Woodcutters earned 63 cents a day, and, in the top brackets, bricklayers or masons often got as much as $1.19 for their labors.

The safety program of that day, if this book is any indication, left much to be desired. Violence sustained by employees was considerable in a world where injuries were due, among other causes, to falling trees being hewed for railroad ties, to collopsing scaffolds, or to runaway horses.

Throughout the book reference is made in almost every case to "investigation ... by Colonel Fuller." We have been unable to track down the identity of Colonel Fuller, but, based upon this ledger, he must have been a considerable power in his own right. In every case of accident, investigation included the questioning of every employee even indirectly asso-

From *The Medical Bulletin*, August, 1952, published by Standard Oil Company (New Jersey) and affiliated Companies.

The Medical Laboratory



Special Ear, Nose and Throat Diagnostic Examination

The Clinic Treatment Room

Weekly Staff Meeting

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ciated with the injury. When a scaffold collapsed, not only the foreman, but also the workmen who constructed it, were questioned. In one case, the rigging of a boom let go, causing an employee to sustain a crush injury to his foot. The ledger reports, "An x-ray photograph was taken at the hospital and the man was discharged the following day, there being nothing wrong with his foot." A note 17 days later states "The man was returned to the hospital and a bone was taken out of his foot."

Because the ledger was not kept as a strict record of medical events, we are given a glimpse into the past when the Bayway Medical Department was young. Other records and the memories of old timers here also helped in compiling this history. From them, we learned that in 1917, or early 1918, a Medical Department was set up and located in the northeast corner of what is now the Main Office Building. It consisted of a small room, plus half of what had been the men's lavoratory, the medical section being separated from the toilet facilities by a thin partition. A doctor and a nurse were stationed here, and employees also were served by a visiting nurse who drove to her rounds by horse and buggy.

Few actual records remain of these times. Several older employees, though, recall some rather exciting events in this medical unit, such as the time an applicant was injured during examination by the exploding of something on the laboratory shelf. Undoubtedly, however, the passage of years has expanded the contents of these tales, and they are told as interesting asides, rather than actual fact.

In 1922, at the completion of what was then known as the "New Medical and Personnel Building," the Department moved from the Main Office. At this time, x-ray, dental, and physiotherapy facilities were added. The surgery and x-ray units were placed—apparently in the fashion of the day—on the second floor of the building, and many were the tales told of the difficulties encountered in getting patients up and down to these facilities using an exceptionally steep flight of stairs.

The staff increased also to meet the demands on the new facilities.

Over the years, many other changes took place at Bayway. The refinery personnel expanded and altered. At the start of World War II, many women replaced the male employees. The employee population became such that in 1946 for the first time in the history of the Bayway Medical Department, nurses were assigned to shift duty to cope with the medical program. To keep up with the medical needs of the expanding refinery, additional space was required by the Department.

ON JUNE 4, 1951, after four years of planning, and at least two years of sporadic construction, the Medical Department moved to its new quarters. These comprised the first floor of the renovated technical service building, to which an extension had been added. From seven, rather dingy, poorly equipped rooms, the Medical Department had expanded to 44 units, subdivided as their special needs required. For example, the main examining unit, known as Diagnostic No. 1, is a compact section providing a combination nurses' office and waiting room, two doctors' offices, and four examination rooms, so arranged that the flow of patients never crosses itself. The x-ray department has been made a separate unit, and has a good-sized waiting room and office of its own, and two separate x-ray rooms connected by a darkroom. One x-ray room, utilizing our old x-ray equipment, is used primarily for chest films. It can handle, if need be, as many as 150 chest x-rays a day. The other x-ray room, which was designed primarily for special diagnostic work, is built about a 200 milli-ampere rotating anode machine with a tilt table fluoroscopic unit. Even the physiotherapy unit is a distinct entity.

There are also provided an office and laboratory facilities for the industrial hygienist who, although on the staff of the New York office, is located at Bayway for convenience' sake.

The work load of the Department is at present handled by a staff of 23, including three physicians. There is a total of 12 nurses. However, only five carry out the traditional duties of the nurse. The others are trained primarily as x-ray or laboratory technicians and as medical assistants.

The Medical Department provides complete industrial medical care for a population of approximately 5,000, and also provides emergency medical care to about 1,000 S.O.D. employees and an indefinite number of Domestic Sales employees, pipe line employees, Marine employees, and outside contractors. The average dispensary visits range from 48,000 to 60,000 patients a year.

"Spend and Spend"

LABOR Department reports reveal the average American family spent $400 more than it earned in 1950, despite the fact people are making more than ever before and the amount of money in circulation is just under an all-time high. What accounts for this family debt? There are two good reasons: (1) the cost of living is the highest in history, and (2) the Treasury last year took more tax dollars out of American pockets than in any other year.

—*Pittsburgh People*, 13:10 (October) 1952.

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INDUSTRIAL MEDICAL ASSOCIATION

The President's Page

THE membership in the Industrial Medical Association, as defined in the By-Laws, is of six classes: Fellow, Active, Associate, Honorary, Inactive and Retired. The By-Laws were revised by a special committee and approved by the Board of Directors, with final approval voted by the membership.

The officers of your Association must be guided by the By-Laws, and cannot make moves or changes contrary to those defined therein. The membership classification is governed by definite rules. So many questions have been received regarding these memberships that an explanation will be given, attempting to interpret the logic of the By-Laws Committee.

ACTIVE MEMBERSHIP, which constitutes the greatest number, is defined to cover all Industrial Physicians actively engaged in the practice of Industrial Medicine or Surgery; or in the investigation of Industrial Medical problems. They must be physicians in good standing, members of a County Medical Society, members of the American Medical Association, and shall have had three years' experience in the practice of medicine, with at least two years' experience in Industrial Medicine. The By-Laws *do not specify* what percentage of the individual's time or practice must be devoted to Industrial Medicine. It is delegated to the Membership Committee to interpret "actively engaged in the practice of Industrial Medicine or Surgery."

ASSOCIATE MEMBERSHIP is made up of those physicians who have the personal and professional qualifications for Active Membership, but whose length of experience in the practice of medicine and surgery, or in the field of Industrial Medicine or Surgery, is not sufficient for Active Membership. It may include specialists in other branches of medicine who have a special interest in Industrial Medicine or Surgery, but are not actively engaged in this specialty. It also includes those individuals taking post-graduate courses in Industrial Medicine. In other words, this group constitutes the newcomers in the field, those in other specialties, and those taking post-graduate work. All others should qualify for Active Membership.

HONORARY MEMBERSHIP is conferred upon physicians and surgeons who have contributed distinguished service to the objectives for which the Association stands, or have performed some special service for the Association. This is a high honor and should be so considered.

INACTIVE MEMBERSHIP is a special provision for those Active Members or Fellows who are disabled and must be relieved of some of their responsibilities and obligations. This is a practical approach to the problem confronting some individuals during a prolonged illness or disability.

RETIRED MEMBERSHIP is provided for those Active Members or Fellows who have been members of the I.M.A. in good standing for 10 years or more at the time of retirement. It also provides for those individuals who are totally and permanently disabled.

FELLOWSHIP is conferred by the Board of Directors of the I.M.A. on those Active Members who have made an outstanding contribution to the field of Industrial Medicine or Surgery. Certain requirements for Fellowship are specified in the By-Laws—Fellows shall be elected from persons who are Active Members and have been actively engaged in the practice of Industrial Medicine or Surgery for at least five years. Additional requirements for Fellowship may be determined by the Board of Examiners. They may require a personal appearance before the Board if they think such is necessary. The Board of Examiners is defined in the By-Laws, and at present is composed of three outstanding Industrial Physicians of unquestionable integrity.

THE question often arises—how can one become a Fellow? The By-Laws provide that at least once a year the District Counselors, assisted by the officers of the respective component societies, shall review the roll of Active Members and make recommendations for Fellowship. The home office of the I.M.A. has furnished each Counselor with a list of all Active Members in his district. Anyone who thinks he should be a Fellow, may contact his component society officers, his Counselor, or your President. Fellowship is granted only by the Industrial Medical Association and never by the Association's component societies.

E. A. Irvin, M.D.

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INDUSTRIAL MEDICAL ASSOCIATION

ELI SHERMAN JONES, M.D., F.A.C.S., has been appointed Second Vice-President of the INDUSTRIAL MEDICAL ASSOCIATION to complete the term of FENN POOLE, untimely deceased through an automobile collision. DR. JONES was born in Fairmount, Indiana, February 9, 1890. He attended Indiana University, where he received his B.S. in 1914, his M.D. in 1916. He interned at City Hospital, Indianapolis, and throughout his career has taken post-graduate studies in most of the medical centers in the United States and Europe. He is presently on the staff of St. Margaret's Hospital, Hammond, and St. Catherine's Hospital, East Chicago, and is a member of the Board of Trustees of the Norman M. Beatty Memorial Hospital at Westville, Indiana. His first industrial affiliation was with the Hammond Bus Company in 1923, and he has been actively engaged in industrial medical work since that time. He is now Chief Surgeon for the Northern Indiana Public Service Company, LaSalle Steel Company, S. G. Taylor Chain Company, American Maize Products, and other concerns, and Plant Physician for Lever Brothers, Rand McNally, Glidden Company, Shell Oil, Swift and Company, and others. In the Indiana State Medical Association he is Chairman of the Committee on Industrial Health, and is alternate delegate from Indiana to the A.M.A.; and he is on the Board of Governors of the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY. He is a Fellow of the American College of Surgeons, the International College of Surgeons, the Academy-International of Medicine, the International Academy of Proctology, the INDUSTRIAL MEDICAL ASSOCIATION, and the A.M.A. Since 1934 he has published numerous articles, mostly on surgical subjects. His office and residence are in Hammond, Indiana, where he is widely known and well liked.

E. S. Jones, M.D.

MEDICALLY IRRELEVANT

Numbers in Man

IT'S ONLY a question of time until either the insects or the statisticians take over the earth. Your own choice as to the more pestiferous, and the ultimate taker-over. Nothing is sacred to either pest. Much has been written, said, poeticized and imagined about the human figure. But how about the human figures? To the statistician, and others governed by the quantitative mind, the human body is just dripping with digits—and we don't mean toes. Here are some random ones compiled by FREDERIC R. STEARNS in *Clinical Medicine:*

"The human heart beats, on the average, 70 times a minute, 100,800 times a day and 2,575,440,000 times in a life span of 70 years. The blood vessels have a combined length of about 100,000 miles; the capillaries have, together, a surface area of one acre. The heart pumps with each beat five ounces of blood into the circulation, which amounts to 22 pints a minute, 1,500 pints an hour, and 4,000 gallons a day. The heart generates sufficient energy, within two hours, to lift a weight of 65 tons one foot in the air.

"Each kidney has about 1,200,000 nephrons, each about two inches long, so that the combined length of all nephrons in an adult would amount to 75 miles. The length of individual capillaries in a glomerulus is about one inch; thus, the total of all capillaries in both kidneys would measure more than 37 miles. The entire filtering surface of all glomeruli exceeds twice the body surface.

"In an adult there are approximately 300,000,000 alveoles in both lungs with an aggregate surface of 700 square feet. The adult absorbs more than 20 cubic feet of oxygen in 24 hours, and the blood releases more than 20 cubic feet of carbon dioxide within the same period.

"There are nine billion ganglion cells in the cerebral cortex and about 12 billion cells in the brain, altogether. The possible number of connections of two neurons in the human brain has been estimated as being 102,783,000. While an electric current in a wire travels 11,160,000 miles a minute, the nerve impulses are conveyed over the axons with a speed of not more than 4½ miles per minute.

"It has been estimated that about 10,000,000 red blood cells are destroyed (and replaced) per second in an adult. The diameter of an erythrocyte is 0.007 mm. An adult is about 250,000 times taller in size than the diameter of an erythrocyte is long. A normal specimen of semen will contain a volume of 2 to 5 cc. and a count of 75 to 100 million spermatozoa per cc.

"The adult has a total of 120,000 hairs on the average scalp; blond individuals have an average of 150,000 hairs and red haired individuals have only 90,000.

"In a newborn male infant there are 270 separate bony units, in a 14 year old boy 250 and in an adult man, 40 years of age, 206.

"Seventy per cent of the weight of the human body is water; 50% is intracellular water and 20% extracellular water. 170 liters of water are filtered from the blood plasma through the kidneys in a 24 hour period.

"The average American adult consumes once every 50 days his own weight in food; a healthy child does so in about 10 days, while an old man does it only once in 65 days. In addition an adult breathes approximately one fifth of his own mass in air within 24 hours.

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"At the end of the first embryonic month the human body is about 8,000 times as heavy as at the beginning of this month. At the end of the second month the weight increase is 500 times the weight of the start of the second month; at the end of the third it is 11 times, and at the end of the fourth month four times, as much as at the beginning of the respective months. Yet, during a life span of 70 years the body multiples its weight at birth by only 20 times.

"It has been figured out that, according to future net-earnings, the money value of the average American individual would be: at age 30, $32,200 to $53,000; at age 40, $21,300 to $54,500; at age 50, $11,000 to $30,000, and at age 55, $6,100 to $18,700.

"Another approach in calculating the individual money value of man was made in terms of energy. If the atoms which compose the human body could be transformed fully in energy a body, weighing 150 pounds, would have a money value of $85.500,000,000 as each pound would produce 11,400,000,000 kilowatt hours of energy, worth $570,000,000. These figures refer to the money value at the time before the dollar lost almost half of its purchasing power. The present figures are correspondingly higher. In order to counterbalance this overoptimistic view on the money value of the individual human body substance, the sober analytical chemical approach of another investigator resulted in the conclusion that the chemical substances which quantitatively make up the human body of a person have a market value of approximately 87 cents."

THAT last figure ruins everything. That dates the piece. That's the 1922 quotation. Now it has been discovered that the quivering flesh of man is so rich in stored vitamins that if all were collected, purified and put on the counter, the 1952 market value for the chemicals of man would be $5.54. But, 'tain't necessarily true that all the values are solely chemical—not for the live ones!

BOOKS

Public Health

ESSENTIALS OF PUBLIC HEALTH: WILLIAM P. SHEPARD, M.D.; CHARLES EDWARD SMTIH, M.D.; RODNEY RAU BEARD, M.D.; LEON BENEDICT REYNOLDS, A.B., SC.D. J. B. Lippincott Company, Philadelphia, 1952, pp. 566, $6.50.

MODESTLY the authors profess astonishment (the authors used the word "surprise") that the first edition of this book should have been so successful. No one else is either astonished or surprised. An even bigger and better life is expected of this edition. Happily, this book on public health stands midway between sound writing for the public reader and the atrocious technical book for the professional public health participant. Those latter books are bounded on the North by a slide rule; on the South by a formula for calculating probable errors; a statistician guards the East; and a virologist presides over the West. The neatly provided mid-point position is what makes "success" for any edition.

It becomes easy for the physician reviewer to espouse the purposes of this book, now stated in the language of the authors:

"We have proceeded from the obvious fact that the great majority of students go to medical school to learn to practice medicine, not to become health officers. Therefore, we intend merely to present the problems, the goals, the rationale and the usual operations of the public health program in brief, simple and readable style, emphasizing the points of impact between the practice of medicine, and discussing the desirable relationships of the physicians to the public health program.

"At times public health progress has been impeded, albeit unwittingly, by some physicians who have failed to grasp the social implications and responsibilities inherent in the practice of medicine. Likewise, the public health profession, consisting of four-fifths non-medical specialists, often has failed to appreciate the viewpoint of the practicing physician, and especially to realize that the attainment of many of the goals of public health depends upon the understanding and wholehearted cooperation of the medical profession. The great major objectives of medicine and of public health are the same: to prevent illness, injury and disability; to restore optimum function; to forestall premature death. For the most part, the two professions have worked hand in hand toward these objectives."

It is only a one-way bet that any book written or edited by Dr. Shepard would contain a chapter on Occupational Health. That author is far from being just on the fringes of occupational health. He has pseudopods reaching deeply into all of that field. Fortunate is that physician claimed by every specialty as one of its own. Dr. Shepard is near to that status. Fully industrial medicine lays claim to him and his abilities.

Not one but two chapters (one by co-author Dr. Rodney Beard) evince the best grasp of the import of occupational medicine yet found in any text of general public health coverage. Seized by admiration, industrial medicine finds in this book a few provocations for fluffing up of the hackles. This statement appears, "In most parts of the United States, public health has become an established function of government and is under the guidance of men trained in that field." That is just what industrial medicine scorns. It wants no governmental control. Statements like the one quoted are causing fast and far running by industrial medicine. No bed sharing is wanted with governmentally controlled public health.

A trenchant cynic long ago observed that man's hope is ever to fall into the arms of lovely woman but never into her hands. So, industrial medicine would enjoy falling into the arms of public health but not into its governmentally controlled hands.

Industrial medicine is always labelled as about to burst forth in something remarkable which regrettably never quite comes to pass. This book furthers this idea in this language: "Industry will soon reach the point where it will seek the highest quality of medical service and advice, just as it now pays for the best trained legal talents." What a fool's paradise some of us long have occupied. Ah well! Give us time. Maybe yet we shall attain to parity with our now betters—the lawyers.

Stress

FIRST ANNUAL REPORT ON STRESS: HANS SELYE, M.D., PH.D. (Prague), D.SC. (McGill), F.R.S. (Canada), Professor and Director of the Institute of Experimental Medicine and Surgery, University

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of Montreal. (Diagrams). Acta, Inc., Montreal, Canada, pp. 511; $10.00.

THE appearance of this book on the reviewer's desk is not a matter of routine or accident. Deliberately this book was sought for review. The word "stress" at once seems to align itself both with industry and the industrial worker. The hope was that, in some simple fashion, a medical formula might have been adduced standing in relationship to the many strains imposed upon industrial workers. The hope grew out of one of Webster's definitions of "stress": "To subject to the action of external forces; to put pressure upon or cause strain to; especially to overstrain."

A handicap to this review is the lack of the author's original text "Stress—The physiology and pathology of exposure to stress, a treatise based on the concept of the General-Adaptation-Syndrome and the Diseases of Adaptation." The present volume, entitled "First Annual Report on Stress, 1951," while set forth as, foremostly, a series of critical abstracts, is indeed more, since it becomes a full-sized text promoting the views of the compiler.

Toward the end of the book, under a sub-heading "Sketch for a Unified Theory of Medicine" the author concludes:

"In my opinion the principal tenets of the currently debated general theories of diseases cannot be refuted, because they are well founded upon objective observations. The salient weakness in each of these theories is precisely the tendency to impose itself at the exclusion of all others. Hence, a unified interpretation of medicine must be one which embraces them all. I attempted to give a rough outline of the manner in which this could perhaps be accomplished with the aid of the stress concept. It remains to be seen whether such a unified theory of medicine will be of heuristic value. Its principal weakness is its vagueness, its failure to explain the ultimate causes of disease. However, it appears to include, and to be compatible with, all the important facts concerning disease in general, which are well established today and I do not think a theory can be useful if it attempts to be more explicit than verified observations warrant."

With concepts so broad as are this author's it is no wonder that readily every disease and almost every medical publication falls within the scope of stress action. Equally, it is no wonder that by the middle of the year 1951 this 1951 book, essentially was ready for the printer. An entire year of coverage might have swamped the presses!

Of his theories, the author at one point states:

"By a series of experiments on animals I could show, in 1936, that the organism responds in a stereotypical manner to a variety of widely different agents, such as infections, intoxications, trauma, nervous strain, heat, cold, muscular fatigue or x-irradiation. The specific actions of all these agents are quite different. Their only common feature is that they place the body in a state of general (systemic) stress. Hence, we concluded that the stereotypical response—which is superimposed upon all specific effects—represents the somatic manifestations of non-specific "stress" itself."

The pursuit of this concept, chiefly, is built around, a "General-Adaptation-Syndrome" (G-A-S). The latter possesses three distinct stages, namely:

the alarm-reaction (A-R), in which adaptation has not yet been acquired,

the stage of resistance (S-R), in which adaptation is optimal,

the stage of exhaustion (S-E), in which the acquired adaptation is lost again."

Elucidating this G-A-S and the Diseases of Adaptation there appear a veritable array of new and old terms such as mineralo-corticoids, gluco-corticoids, somatotrophic hormones, conditioning of hormone action, derailments of the G-A-S, stressors, first mediator, adaptation energy, formaldehydogenic corticoids, etc.

This review neither embraces nor condemns the contents of this book. The oppressing confusion possibly springs from the absence of the initial publication. Perhaps if any recommendation should be made, it is that not this 1951 review but the original publication be procured. It is agreed with the author that if stress involves hormones, enzymes, and the electric action potentials of nerves, it indeed works through a complicated system. The reviewer awaits a little more simplicity.

Scientific Methods

THE APPLICATION OF SCIENTIFIC METHODS TO INDUSTRIAL AND SERVICE MEDICINE: Privy Council, Medical Research Council. London, England, 1951, pp. 112; Three shillings.

THE first printing of this brochure contained a grievous error—so grievous that the publication officer hastily set about the retrievement of all earlier distributed copies. His earnest plea, instead of evoking eagerness to respond, provided an intense desire to retain the inaccurate copy, hoping that some juicy bit might appear thereby making for a collector's item. The amended printing, now in hand, so closely resembles the evil printing that only the initiated knows which is which. Still, plaintively, the call is made for all outstanding first printing copies. These may be sent to S. L. Smith, Publications Officer, 38 Old Queen Street, Westminster, S.W.1., England.

This journal studiedly seeks to avoid the stereotyped book review stigmatized by the mere listing of tables of contents. That would be anathematous! In this instance the temptation is to break the practice since the listed contents precisely reveal the subsequent text. That impulse is, in part, survived. Foremostly, this is a booklet promoting the application of scientific procedure in industrial medical requirements. The contents run to "Scientific Method in Field Surveys; Scientific Investigation of Special Health Hazards; the Appraisal of Human Performance by Laboratory Inquiries." The flavor of numerous sub-headings is suggested in this title "The Use of Experimental Pathological Techniques in Assessing the Toxicity of Chemical Compounds." Another sub-heading "Anatomical Factors in Machine Design" is dear to the heart of this reviewer and prompts immediate approving belligerence. This short article points out, in generalities, the lack of proper measurements in almost everything about us in terms of the increased body measurements of human beings in most industrial lands. While accent is on machines, by implication, de-

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ficiencies are everywhere, as in heights of sinks, the lowness of ovens and cooking ranges, the length of sleeping car berths, the height of restaurant tables. For the six-foot-two "wallopus" the great outrage is the recessed, small drinking fountain of 36-inch height hampered by the overhanging fixture for convenience of those who would obtain their drinking water in glasses. The close resemblance to the performance of the giraffe at the water hole is all too painfully in evidence. Apparently, everything is adjusted to the stature of the shortest individual. Granting some validity in the attitude, it still may be noted that adults are not expected to do their sleeping in cribs and trundle beds. If, in some manner, this article may soften the rigidity of the machine designer chained to his ancient standards, a flow of praise will spring from the throats of the long-suffering men and women who find difficulty in lifelong adjustment to a world of five foot seven human beings.

If this comment reflects the flavor of one single item, let it be said that all 16 others are equally provocative.

Causalgia

CAUSALGIA: FRANK H. MAYFIELD, M.D.: Illustrated; Charles C. Thomas, Publisher, Springfield, Illinois, 1951, pp. 54, $2.25.

THIS small, illustrated brochure utilizes military experience but clearly this same condition, causalgia, may and does arise in industry—less frequently, but no less troublesomely.

"Wounds to peripheral nerves at times set off a bizarre symptom complex known as 'Causalgia.' In 1872 Weir Mitchell introduced the term to describe the outstanding feature of the disorder, namely, burning pain: 'Perhaps few persons who are not physicians can realize the influence which long-continued and unendurable pain may have on both body and mind. Under such torments the temper changes, the most amiable grow irritable, the bravest soldier becomes a coward, and the strongest man is scarcely less nervous than the most hysterical girl. Nothing can better illustrate the extent to which these statements may be true than the cases of burning pain, or, as I prefer to term it, 'Causalgia,' the most terrible of all tortures which a nerve wound may inflict.

"The diagnosis of causalgia should be made only when the following criteria exist: Severe pain (usually burning) in an extremity after injury to a peripheral nerve in association with certain vasomotor and trophic changes as described, the pain exaggerated by emotional stimuli and relieved by procaine injection of the sympathetic chain.

"There appears to be a general belief that patients with causalgia due to civilian accidents which entail damage suits or industrial compensation do less well than those reported from the military services. This belief does not appear justified, even though it is recognized that long-continued pain may lead to drug addiction and emotional instability incompatible with industrial usefulness, and indeed that desire for compensation may lead to malingering.

"The pathologic mechanism of causalgia is a shunting or short-circuiting of impulses from the sympathetic into the sensory fibers of the injured nerve.

"It is the writer's opinion that causalgia is a clinical entity characterized by pain (usually burning) in association with vasomotor and trophic changes following injury to the peripheral nerves. The pain is increased by emotional and environmental stimuli. It occurs most frequently with wounds of the median and sciatic nerves, but is observed after injury to other nerves. The probable pathologic mechanism is interaction of impulses between sympathetic and sensory fibers at the site of injury. The disorder in severe form occurs in approximately 2% to 5% of major nerve injuries.

"The pain can be relieved by appropriate sympathectomy. The sympathectomy, however, must be complete, and in certain instances where the lower extremity is involved, removal of the lower dorsal sympathetic chain may be necessary.

"Procaine block of the appropriate sympathetic chain is a valuable diagnostic procedure, and in many instances is reported as an effective therapeutic agent and should be tried prior to surgery."

This handsome small monograph is completed by a section describing in detail the techniques of surgery appropriate to the condition's requirements. The conviction is that this book presents in condensed form all that is known about causalgia.

Tropical Medicine

CLINICAL TROPICAL MEDICINE: R. B. H. GRADWOHL, M.D., Editor-in-Chief. Illustrated. The C. V. Mosby Company, St. Louis, 1951, pp. 1647.

THE TROPICS are no longer the exclusive loci of tropical diseases. In truth, they never were. For reasons of habit and convenience, numerous diseases well known to climes remote to the tropics are customarily catalogued as tropical diseases. Malaria is the convincing example; others may be found in tularemia, Brazilian hookworm, and brucellosis. The very term "tropical medicine" may be challenged as to pertinency, and, in fact, is, in the publication here reviewed. "Exotic disease" has been projected as superior. That term likewise fails, since many diseases are no more exotic than tropical.

In a shrinking world three factors tend to make tropical diseases comparatively commonplace in the United States and other non-tropical portions of the earth. Current and recent warfare has returned to their homes some millions of the military earlier stationed in tropical or subtropical countries. A fair number brought their tropical diseases with them. The first sizable epidemic of amebic dysentery in the United States originated at an Army post in Texas, in 1916. A few years later, the nation's most severe epidemic radiated from Chicago.

The second influence springs from rapid transportation. Any plane from a tropical country might bring into this land one or more passengers in the incubation stage of some tropical disease. With emphasis, the officers of quarantine services may not be charged with any degree of remissness. Rapid transportation sorely has burdened public health officers with new and almost unsurmountable difficulties. On a plane from the South American tropics and subtropics might be a passenger just previously infected with the organism of cutaneous leishmaniasis. Nothing is in evidence and the vic-

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tim appears healthy. The incubation period for that disease, while ordinarily shorter, ranges up to 60 days. In due course the disease appears. Truly no phlebotomus flies, the probable vector, have invaded the land, but it is now accepted that direct contact may spread the affection. The passenger's family soon could be involved. Soon, too, the children might introduce leishmaniasis to the schoolroom. Thus, the possibility of this tropical disease in Minnesota or Ohio. The third contributor is wider distribution of the disease vectors or the offending insect. The common rat mite is probably of tropical origin. Nowadays a potential epidemic of rat mite dermatitis is as near as the closest rat nest.

In reverse form, tropical diseases are now more closely identified with this country. Numerous large industries operating on an international basis yearly train and send industrial physicians to their tropical outposts. Many of these physicians find themselves in the thick of tropical diseases in their natural habitat. A medical training center in New York engaged in tropical disease instruction may be far less concerned in the tropical diseases of New York state than in those of Columbia or Honduras.

All this and more is what makes this "Clinical Tropical Medicine" cogent to medical activities everywhere. This massive book, beautifully illustrated, has been prepared by 57 contributors—mostly on the spot investigators—masters in their domains. While so many authors produced their chapters and sections, admirable cohesion is everywhere in evidence. This tribute is to the editors who have provided a quality of unity rarely found in the multi-authored book. This book contains everything, and everything in solid, documented form. It deserves reading and usage throughout medicine, including industrial medicine.

Preventive Medicine

ROSENAU PREVENTIVE MEDICINE AND HYGIENE: KENNETH F. MAXCY, M.D., DR. P.H. Illustrated; Appleton-Century-Crofts, Inc., New York, 1951; pp. 1447; $14.00.

THE patience and the eagerness that attended watching for the new seventh edition "Rosenau" have been rewarded. The book finally is out, and splendid. For review purposes this seventh edition was laid alongside the third edition. This ancient recalls the elation stirred by that 1920 publication. Seemingly all that might be said, backward and forward, was encompassed in that third issue. In the ensuing 31 years so much has happened in the preventive medicine world that any blood kinship is not obvious. The third edition was designated of "military" import, but, appearing in 1920, there was no present military emergency. In vain, but not in despair, one looks through the new index seeking just once the word "military" or "war" or "army"—not a word. That one item reflects the striking departures that characterize the new "Rosenau"— the new "Maxcy." This seventh edition reveals difference nowhere so much as in the multiplicity of authors. The earlier "Rosenaus" were peculiarly a one man job, or at most a few man job. Twenty-seven authors made the present edition. Every section is a monograph, and every monograph of high quality. The slanted mind of this Journal reached into those numerous pages devoted to occupational health. That portion of preventive medicine in proper apportionment to its related subjects fits into the total pattern. In fact, no section of the entire book appears over- or underdone. Balance is the word.

Forty years ago, the ambitious medical student advertised his calling by acquiring obstetrical forceps and carrying that lubberly instrument about in the hip pockets. Prideful promotion. This new Maxcy is just a little large for any garment pocket, but ownership and nearness to the work table are going to be well-nigh indispensible—both for the student and the Nestor in preventive medicine.

Nursing in Small Plants

NURSING SERVICES IN SMALL MANUFACTURING PLANTS: A TIME STUDY. ELEANOR C. BAILEY and ELIZABETH S. FRASIER, Federal Security Agency, Public Health Service, Washington, D.C., 1952, pp 37.

ANY publication, book or pamphlet, that embraces in the title any reference to medical services in small manufacturing plants deserves review. The small plant is, and long has been, the wracking dilemma of industrial health. Some day, illumination will come, but full illumination is not in this pamphlet. It helps, and is just one more resting point along the toilsome way. The study leading to this report is concerned with the time requirements for the nurses under many circumstances in small plants.

Small plant medical services are left unsolved, but at least the nurse may be informed on time budgeting. That step is forward.

LETTERS

Dermatology

TO THE EDITOR: While in London this summer attending the Tenth International Congress of Dermatology I submitted a film which shows the various types of cutaneous disturbances due to occupation. It also shows the methods of patch-testing patients, as well as various non-occupational cutaneous diseases for which claim for compensation has been made.

Great interest was evinced in this film, and several of the foreign dermatologists requested to have it shown in their countries—for example, Sweden.

This film has been shown in quite a few medical schools in the United States, and it occurred to me that it might be of interest to industrial physicians. It is the type of film that could be shown before a large group of nurses, etc., and I thought it might be well to mention it in your Journal.

Approved by the American College of Surgeons, it is listed in their pamphlet. The film can be secured through the Boston University Film Library at 332 Bay State Road, Boston. This library also has an interesting film of mine on clinical and laboratory studies of fungus infections.

—J. G. DOWNING, M.D.,
520 Commonwealth Ave.,
Boston, Massachusetts.

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PRODUCT RESEARCH AND DEVELOPMENT

Articles selected for publication in this section of the Journal are related to commercial or prospectively commercial products and, by requirement, are written by physicians, represent original work not previously published, and have some flavor of newness. These articles are published so that newer products may become the recipients of further consideration and appraisal in the industrial medical field. The claims and conclusions of authors are not necessarily approved or accepted by this Journal.

Symptomatic Treatment of the Common Cold

F. J. WEISMILLER, M.D.
Medical Director, Bausch & Lomb Optical Company
Rochester, New York

ABSENTEEISM, as a direct result of cold infection, has caused nation-wide concern for many years. Medically, we have not derived a therapeutic agent which possesses specificity against the virus which is considered the etiological factor of the common cold.

While the cold (barring complications) is rarely a permanent problem to an individual's health, the subjective symptoms of the infection are annoying and uncomfortable, particularly during the initial stages of the cold. Because of the inability of most individuals suffering from colds to maintain a normal activity during the period when symptoms are at their worst, many needed man-hours are lost to industry. The therapeutic approach to the problem has therefore been directed to the relief of the individual's symptoms and discomfort, thus enabling him to feel reasonably well while working and recover in the usual three to four days.

To relieve the numerous cold symptoms such as the "stuffed nose," general malaise, headache, etc., a comparison of effectiveness between two combinations of drugs, and a placebo was made. The subjects and methods used and the results obtained are described.

Subjects

CANDIDATES for the study were chosen, irrespective of sex, from the employees of the Bausch and Lomb Optical Company as they reported to the Medical Department for the treatment of their colds. The greatest care was used to select individuals who complained only of a cold. In the main, the stuffy nose, acute coryza, headache, general malaise and mild pyrexia were considered as the predominant complaints.

If there was any suspicion that the individual had bronchitis, bacterial infection of the throat, or if the oral temperature exceeded 100°F, the individual was immediately referred to his or her family physician.

The nurses took oral temperatures and questioned the employees concerning their complaints, and unless three or more of the usual cold symptoms were present the individual was not included in the study.

Materials and Methods

THREE formulations were compounded and were designated as compound X, compound Y, and compound Z. These formulations were compressed in a yellow, uncoated, scored tablet which could be swallowed whole, dissolved in water, or chewed in the mouth before swallowing. The tablets were identical in physical appearance and contained the following:

Compound X[1]—A placebo	
Compound Y[2]	
acetyl-p-aminophenol	300 mg.
salicylamide	200 mg.
racemic amphetamine phosphate monobasic	2 mg.
methyl-atropine nitrate	0.5 mg.
Compound Z	
salicylamide	500 mg.
racemic amphetamine phosphate monobasic	2 mg.
methyl-atropine nitrate	0.5 mg.

Subjects for the study were each given an envelope containing 18 tablets with directions to take two tablets with each meal for three days. It was also suggested that they force fluids and get as much rest as possible after working hours. A total of 58 employees with colds were given compound X, 275 were given compound Y, and 24 were given compound Z.

Because it had been rumored that acetyl-p-aminophenol might be an agent responsible for producing agranulocytosis, a WBC and differential was done on seven individuals receiving compound Y, prior to the administration of the medicament and again after three days therapy.

On the day following the cessation of therapy the employee was consulted by a nurse and asked the following questions, which were general enough to allow the patient to express his personal views on the effectiveness of the therapy:

1. Did the tablets help your cold?
2. Did the tablets make you feel nauseated, or dizzy, or give you heartburn or any other untoward effects?

---

1. Supplied through the courtesy of the R. J. Strasenburgh Co.
2. Now marketed by the R. J. Strasenburgh Co. under the name Strascogesic.

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3. Do you feel that the tablets were responsible for your being able to remain at work?

Results

THE results with respect to the answers given the three questions asked subsequent to therapy are summarized in Table I. Of singular importance is the fact that of the 40 individuals who did not feel that the compound Y was responsible for their being able to stay at work, only six lost time from work, the average time lost being one to two days. Of the 58 employees receiving compound X (placebo), 43 individuals felt that the compound X was not responsible for their being able to remain at work, and 10 of this group lost time from work, the average being five days.

TABLE I.

Question No.	Compound	Yes	No
(1) Do you feel that the tablets helped your cold?	X	37	21
	Y	223	52
	Z	15	9
(2) Did the tablets make you feel nauseated, dizzy, give you heartburn, etc.?	X	2	56
	Y	36	239
	Z	6	18
(3) Do you feel that the medication was responsible for your being able to remain at work?	X	15	43
	Y	235	40
	Z	20	4

Of the 235 individuals who stated that compound Y definitely helped their cold, there was no member of the group who lost any time from work. Of the total number receiving compound Y, 13% complained of side effects. These complaints included dryness of the mouth and nausea but were never severe, and in no instance did medication have to be withdrawn because of untoward reactions. Two individuals taking compound X complained of mild temporary gastrointestinal changes. Those taking compound Z—although 20 people felt their cold was improved—did not seem to obtain the best clinical effect against their cold.

As to blood cell counts, in no instance were there found any abnormalities either in number or type of cells. The counts were all within normal limits indicating no tendency towards agranulocytosis.

Comment

THE clinical results from the use of compound Y have been gratifying. Objectively, the ability of a drug or drug combination to decrease the number of man-hours lost to industry as a result of colds is evidence of its effectiveness as a therapeutic adjunct in cold treatment. Of the group taking compound Y therapy, the number of individuals forced to remain at home until their colds were better, was strikingly less than in any other group, and, of equal importance is the fact that, of those who were forced to be absent from work, only one remained out for more than two days.

Since our use of this controlled group, we have continued dispensing compound Y, and, while we were unable to keep accurate records, the use of the combination has been pleasing. The results of the above work and the tremendous demand by the employees have led us to continue the use of this medicament.

Summary

THE comparative effectiveness of two drug combinations and a placebo against subjective cold symptoms has been reported in a series of 357 individuals.

In alleviating the subjective cold symptoms, a combination of salicylamide, acetyl-p-aminophenol, racemic amphetamine phosphate monobasic, and atropine methyl nitrate, proved to be effective in 85% of the individuals given the therapy.

Leucocyte count and differential data provide no indication of any abnormalities in cell numbers or structure.

We Never Had It So Good?

IT IS ONE of the ironies of our times that the "cheapest" way to increase income is not by working more and earning more, but by reducing buying. Additional income incurs more taxes; reduced expenditures do not. So savings, when they are at all possible, can best be added to by cutting down on purchases—which, of course, defeats the objective of saving under existing tax levels. The fact that the nation's productive progress has been based on the encouragement of the individual's desire to earn more through working more, seems not to have entered the heads of modern tax-framers.

—From the *St. Louis Globe-Democrat*, quoted in *Pittsburgh People*, 13:10 (October) 1952, Magazine of Pittsburgh Plate Glass Company.

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INDUSTRIAL MEDICINE AND SURGERY

EXECUTIVE, EDITORIAL, AND PUBLICATION OFFICES: 605 NORTH MICHIGAN AVENUE, CHICAGO, ILLINOIS

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ESTABLISHED 1932 *Publisher:* A. D. CLOUD

Volume 21 NOVEMBER 1952 *Number 11*

The Louisville Leviathans

THE TITLE refers to no loudly-cheered baseball or football team. When any large city of 370,000, such as Louisville, whips up equal excitement over its team standing in its particular league, and over what it sees when viewing apprehensively the general corporeal region punctuated by what is known anatomically as the umbilicus—that's news. When in part that miracle is wrought by physicians close to industrial medicine, that's industrial medical news.

Of all cities, who would have envisaged Louisville, on a citywide basis, donning its own horsey blinkers in order to concentrate on its omphaloskepsis—belly gazing, if you don't have a dictionary. What Louisville saw in this quiet contemplation, Louisville didn't like—obesity, corpulency, adiposity, turgidity, embonpoint, behemothism—let's face it, big fat bellies, with other bodily regions, partly unmentionable, equally oppressed.

Another writer, Vance Packard, contributing his astonishment to *American Magazine* (August, 1952) commits 100,000 of Louisville's 370,000 omphalators to the leviathan state, but for the nation only 25,000,000 of these hefties. The computable ratios little flatter Louisville's tape stretching—nearly twice the percent in Kentucky's proud city? All that reflects the irresistible appeal of country ham and hominy, grits, hush puppies, hoe cakes, fried apple pies, turnip greens, and, oh yes, Bourbon has its calories, too.

Louisville for months has been in a three-stage heat. First its people were "het" up to discover that it was a city of fatties, although no claim is made to uniqueness in that category. Then came the swivet of proper ways and means for shooing away the tonnage and repelling the excessive calories. Few persons prayed before Buddha, and those who did devoutly wished they had emulated Vishnu. The third phase of warmth came from exultation when, to the astonishment and satisfaction of the many, the hand of the scales did run backward.

Everybody got into the act—individuals, luncheon clubs, stores, hospitals, public health agencies, medical associations, social service workers, insurance companies, the industrialists, and public officials. The possible sufferers, the grocers, the restaurateurs, the bakers, the brewers, the confectioners, were so busy questioning the reliability of their own bathroom scales as to overlook any possible business shrinkage taking place along with the shrinkage of their girth.

This is no factual recital of the achievements, or methods of achievement, in Louisville's municipal project "Shrinkage." That for other pages. Cogently, emphasis is pointed only to two aspects of the beneficient upheaval. The first of these is that what Louisville has wrought in dissipating some 150 tons of unwanted human adiposity, likewise may be accomplished in any other area. When Louisville, or any other city, decides it wants no ravaging from tuberculosis, tuberculosis signally may be reduced to insignificance. When Louisville, or any other city, determines it wants less of the disturbances of noise, then noise will disappear. That is the great lesson for the citizenry. There are few limitations.

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The second objective, and an equally happy one, is to recognize that the Louisville enterprise did not spring from nothingness into full action. Before the victory stood the vision, the planners, the inspirers, the bold ones. Foremostly among the many stand two closely in touch with the mainsprings of industrial health. These two motivators, man and wife, DR. MARJORIE ROWNTREE and DR. GRADIE ROWNTREE.

A salute is made.

The Back Door Sneak

WHEN the United States encountered difficulty through the laxity of state laws in protecting migratory birds, what could be more benevolent than the control of the situation through international treaty. This was accomplished, and all applauded. Well might one wish that the consideration extended to these international citizens, the genus anas, equally benevolently might be provided those other citizens, homo sapiens. In behalf of the avian world, many thanks.

It might be anticipated that this instrument of international bindings, even when not called "treaties" but instead "conventions" and such, might be attempted for malevolent ends. It was expectable that the proponents of socialized medicine, having failed somewhat but not signally in this country, might conspire on the international level and thus thrust this evil into our lives through the back door of the international pact as ratified. This is just where the World Medical Association made entry upon the scene.

The World Medical Association is mostly known to the physicians of this country through the glamorous—the appeal to the traveler, Greece (the General Assembly in Athens in October, 1952), the colorful, the romantic, the historic, the adventurous—but not entirely forgetting the General Assembly.

Actually, that enterprise is but the symbol of a little known array of behind-common view, the day-by-day, the month-by-month work. The record of its activities is stupendous. From its multi-phasic report a single item is excerpted—a return to that attempted back door entry.

"The International Labor Organization recently held a congress at which certain resolutions were adopted which would be inimical to the interests of medicine and the allied professions in this country. A delegation from WMA went to Geneva and interviewed the officials of ILO requesting that the document WMA had prepared be distributed to the delegates of the ILO congress. This was refused, and the only document given the delegates on the medical aspects of social security was one prepared by a World Health Organization Committee on which there was not a single practicing physician. WMA saw that its document was distributed individually, and it has circularized the medical profession of the world enlisting support of its position. The ILO congress' recommendations will be presented to the United States Senate for adoption, and adoption would lead to socialization of medicine and the allied professions through international action.

"The World Medical Association is the only international organization which can speak for the practising medical and allied professions before other international bodies on any but strictly scientific matters. An increasing number of problems pertaining to health are being discussed and decided on an international level, and it is highly important that opinions other than those of governments are considered.

"Had it not been for the alertness of the WMA this ILO program would probably have passed unnoticed and would not have come to the attention of the professions and the public until presented for adoption by the various governments."

A new watchdog is in our midst. A keen-eyed, agile watchdog. May his teeth be sharp and his jaws strong when biting becomes a virtue. Not always are the intents of international pacts praiseworthy. Evil ever stalks in the guise of benignity.

Isms

SOMEONE has said, quite correctly, that if you want your father to take care of you—that's Paternalism; if you want your mother to take care of you—that's Maternalism; if you want Uncle Sam to take care of you—that's Socialism; if you want Uncle Joe to take care of you—that's Communism. But if you can take care of yourself—that's Americanism.

—LOWELL F. JOHNSON, at the First Annual Conference on Industrial Vision, Rutgers University.

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NEWS, COMMENT, OPINION

THERE are a hundred jobs in the garages of today for every one in the livery stable of yesterday. —HERBERT HOOVER.

CHROMATE dermatitis in railroad employees and others working with Diesel engines is always to be thought of in view of the fact that sodium chromate is an ingredient of Diesel radiator fluid.

—From "Keeping Up With Medicine," in *Ohio State Med. J.*, October, 1952.

Radium Wristband

A SAFETY DEVICE, consisting of a radium-bearing wristband and a Geiger counter, has been developed (by Modern Air Corporation, 400 Preda, San Leandro, California) to protect machine tool operators. If hands are in a danger zone or out of a specified safety zone, the counter picks up radiation from the wristband, operating an anti-trip device to stop the machine.

—*Pasadena Independent*, September 11, 1952.

Accident Cost

OCCUPATIONAL accidents cost American industry a total of $2,650,000,000 during 1951, according to E. D. Sirois, of the Massachusetts Mutual Insurance 200th Anniversary Committee, who said there were 16,000 deaths and 2,100,000 injuries in on-the-job accidents last year.

—*Boston American*, September 17, 1952.

Safety in Manufacturing

MAXWELL C. WEAVER, President, The Randall Company, Cincinnati, in *U.S.A., The Magazine of American Affairs* (October, 1952): DR. W. A. SAWYER'S story 'Employee Health is Good Business' in the July issue of *U.S.A.* was excellent.... Adequate medical service for employees is a basic element of sound management. There is one point, however, which may be misunderstood. DR. SAWYER correctly reported that more than two million occupational injuries occurred during 1951, of which about 16,000 resulted in death. He then goes on to say that these injuries were the equivalent of about one injury to every 32 workers. A bit of arithmetic makes it clear that DR. SAWYER was relating these two million injuries to the entire national work-force, but—and I fear that it is a big "but"—all too many readers will assume that he was talking about injuries and deaths which occurred in the factories of manufacturing industries. Actually, about 17% of these deaths —2,700—occurred in manufacturing industries and about 500,000 of the injuries. The remaining one and a half million injuries and the remaining 83% of the deaths took place on farms, in mines, on construction jobs, in stores, and in government service."

Fatal

AMONG fatal occupational accidents, falls ranked first, accounting for 18%, according to the Metropolitan Life Insurance Company; motor vehicle fatalities followed close behind with 15%. Machine injuries and mishaps in mines and quarries each contributed an additional 13%. Fatal injuries in railroad accidents ranked next with 7% of deaths.

—*Management Review*, September, 1952, quoting *Canadian Business*.

The Heart in Industry

THE FIRST "Heart in Industry" Conference in Chicago will be held November 13, 1952, at the Palmer House, under the sponsorship of the Chicago Heart Association. Cooperating organizations include Chicago Association of Commerce and Industry, the Employers Association of Chicago, Illinois Manufacturers Association, Industrial Relations Association, CHICAGO SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY, Chicago Society of Physical Medicine and Rehabilitation, and Industrial Nurses Division of the First District, Illinois State Nurses Association. With DR. OGLESBY PAUL, Clinical Associate Professor of Medicine, University of Illinois, and Chairman of the Community Service Committee of the Chicago Heart Association, presiding, the speakers at the morning session, and their subjects, will include: DR. IRVINE H. PAGE, Director of Research, Cleveland Clinic, on "High Blood Pressure in Industry." DR. NORMAN N. PLUMMER, Medical Director, New York Telephone Company, on "Rheumatic Hearts Can

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Medical Director: (121) M.D. degree, Tufts; 15 years, Medical Director, several large companies; familiar with textile mill problems; I.M.A.; middle forties.

Medical Director: (122) M.D. degree, Johns Hopkins; M.S., medicine; Diplomate, Internal Medicine; Clinical Professor, Industrial Medicine, important university medical school; past eight years, Medical Director, one of America's leading companies; outstanding man.

Medical Director: (123) Highly qualified in industrial medicine; six years, Medical Director, large company; four years, Medical Director, leading manufacturer; demonstrated ability in reorganizational work; early forties.

Medical Director: (124) Past five years, Assistant Medical Director, leading company; well trained man on way up; member, all industrial medicine associations; large capacity; excellent references.

Medical Director: (125) late thirties; five years, private industrial practice; well qualified, traumatic surgery; four years, plant physician and assistant Medical Director, important industrial company; making industrial medicine his career; excellent references.

Surgeons: (126) early thirties; M.D. degree, George Washington; Board eligible; three years, Chief, Surgery and Orthopedic Surgery, very large general hospital; seeks full or part time industrial surgery in larger city with opportunity to engage in private practice; DNB.

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D-187: Diplomate, American Board, Internal Medicine; complete charge, medical clinic; home office of important company; excellent opportunity to travel; outstanding potential for advancement; about $15,000.

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Work." DR. H. M. MARVIN, Past-President, American Heart Association and Associate Clinical Professor of Medicine, Yale, on "The Executive and His Heart Attack." DR. HERMAN K. HELLERSTEIN, Instructor of Medicine, Western Reserve University School of Medicine and University Hospitals, and Director, Work Classification Clinic, Cleveland Area Heart Society, on "Returning Sick Hearts to Work." At the luncheon session, G. MURRAY CAMPBELL, Vice-President, Baltimore & Ohio Railroad, will speak on "Industry's Responsibility for the Human Machine." DR. HOWARD A. LINDBERG, Medical Director, Peoples Gas Light & Coke Company, Assistant Professor of Medicine, Northwestern University, and Chairman, Chicago Heart Association's Industrial Health and Rehabilitation Committee, will preside at the afternoon session. Speakers and their subjects include: DR. EDWARD M. KLINE, Cleveland, Medical Consultant, General Electric Company, on "The Industrial Physician Can Help." CURTIS B. GALLENBECK, Superintendent, Personnel and Industrial Relations Research Department, Inland Steel Company, on "Good Employment Policy on Cardiacs." STANLEY JOHNSON, Chicago, Secretary-Treasurer, Illinois State Federation of Labor, and HAROLD KATZ, Chicago, Attorney, Region 4, United Auto Workers, on "Organized Labor and the Man with Heart Disease." DR. CLIFTON L. REEDER, Medical Director, Continental Assurance Company, Chicago, on "Cardiacs in Industry and Insurance." FRANK PEREGRINE, Chicago, of Peregrine and Bruegger, attorneys, on "Workmen's Compensation Problems." There will be panel discussions and case presentations following both the sessions, with all morning and afternoon speakers participating. DR. PAUL B. MAGNUSEN, Chairman, Chicago Rehabilitation Institute, will be Moderator of the morning discussion, with DR. LOUIS N. KATZ, Director, Cardiovascular Department, Medical Research Institute, Michael Reese Hospital, and Past-President, American Heart Association, as Moderator in the afternoon.

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Industrial Health Program

A PROGRAM to interest general practitioners in industrial medicine recently was launched by the joint committee on education of the American Academy of General Practice and the Council on Industrial Health of the American Medical Association. The project proposes to encourage an understanding of industrial health problems by management and physicians and to develop an education program geared to the general practitioner on both the undergraduate and post-graduate level. Since more than 90% of American industries employ less than 100 workers, the "family doctor" also must be educated on the part he can play in supervising and directing health and safety programs in small plants without interfering with his regular

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practice. The AMA's Council is prepared to assist local medical societies in carrying out educational programs designed to bring the employer and physician together by sponsoring local industrial health meetings.

—*Pennsylvania Med. J.*, September, 1952.

Small Plants

SMALL plant health services receive the attention deserved in the August issue of *Occupational Health*, published by the U.S. Public Health Service. In this issue, various authors discuss the cost of small plant health services, the ways that such services will increase production, and patterns for setting up health services in plants of various sizes. Results of health services are reported from various sized plants. These results are reduced compensation costs, reductions in the number of accidents, reduced absenteeism, etc. One plant, a foundry, reported that labor turnover was its major expense item. For example, the cost of training an average molder was estimated at $200. As a result of the in-plant program, the turnover at the plant was materially reduced. Another plant, with about 250 women workers, reduced the labor turnover from an average of 15 a month to less than five a month.

—*Nursing World*, October, 1952.

Jeopardy

THE same forces which unsuccessfully attempted to socialize the medical profession through Federal legislation are finding it much easier to work through the United Nations and the International Labour Office. In our enthusiasm to espouse such principles as *fundamental human rights, social progress,* and *international peace and security,* we have aided and abetted the activities of these forces. Through the wholesale approval of treaties, conventions, and executive agreements our international representatives have placed not only American medicine but our national sovereignty and our Constitution in jeopardy.

—GEORGE F. LULL, M.D., in *Pennsylvania Med. J.*, September, 1952.

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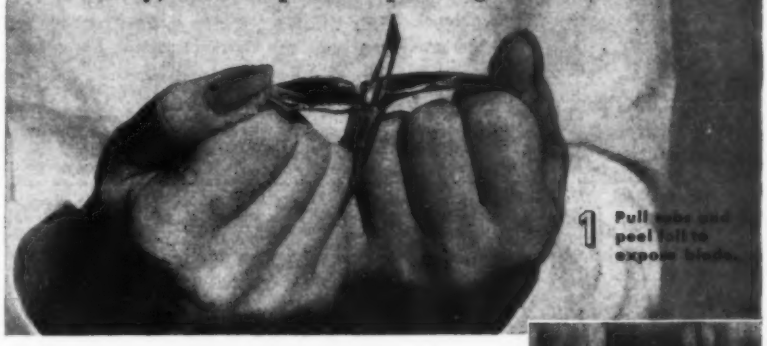

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turers Association. Sickness and accident benefits were increased from $15 per week to $20; maximum surgical benefits from $150 to $300; and hospitalization benefits from $6 to $9 per day. All benefits provided by the union's social insurance fund are financed by employers' contributions of 2 per cent of weekly payrolls.

—*Nursing World*, October, 1952.

Often Hampered

THERE is a great deal yet to be done before the National Health Service gives real satisfaction to both public and profession. There has been a big outcrop of administrators, particularly in the hospital service. Those who minister to the sick are often hampered by those who administer. The fact that a Conservative government has proposed and the profession has accepted a further restriction of the numbers a general practitioner may have on his list does to this extent challenge the B.M.A.'s fundamental principle of free choice of doctor. This is linked up with the payment by capitation fee. Any further restrictions would tend to bring a salaried service a stage nearer.

—From "Background of Britain's Health Service," by HUGH CLEGG, M.D., F.R.C.P., in *New England J. Med.*, September 18, 1952.

Noise

INCREASING concern is being expressed in industrial circles relative to compensation claims associated with supposed hearing loss resulting from noise related to industrial processes. This has medical implications of great concern to many doctors.

—D. E. DORCHESTER, M.D., quoted in *Stevens Point, Wisconsin, Journal*, September 18, 1952.

Little Wrong; Much Right

WE HAVE heard charges, from some quarters, that much is wrong with the medical profession. We have winced at undeserved barbs and have blushed in shame when occasionally one of our members has let us down. But for each line on what is wrong, a book could be written on what is right. I am proud of the traditions, the accomplishments and the ideals of the profession which is unequalled in its service to all regardless of circumstances and which asks no favors except to be let alone by meddling politicians.

—ALFRED R. SUGG, M.D., in *J. Oklahoma State M.A.*, quoted in *West Virginia M.J.*, October, 1952.

"The Way Wo Do Business"

THE early history of industrialized society is that of workers, once artisans, shorn of their identity in the dehumanizing atmosphere of mechanized power. Submerged in the shadows of machines, they became expendable commodities, "hired hands"—hands to be worn, torn, twisted, scrapped. Stresses were not gauged to their tolerances, but rather to the maximum capacities of the machines that drove

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them. "The greatest profit at any cost" is the echo that can be heard from yesterday's philosophy of industrialization. It cannot be said there is no counterpart today to that early production philosophy. Granted, today that philosophy is muttered, rather than brazenly stated. Recently such muttering reached me in the words of an industrialist with whom I am happy to say I am not associated. He said: "We know we are poisoning our workers. We know we are contaminating the community. Until we are forced to stop, we will continue to do so. That is a hell of a statement to make; but that is the way we do business."

—From an Address by F. BENEDICT LANAHAN, M.D., at the Ninth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS, Cincinnati, April 24, 1952.

William Stewart Halsted

IN ONE of the surgical fields he cultivated, vascular surgery, he would have been amazed at the progress already made and in prospect. Indeed, he would prophecy that substitution or replacement surgery would supply needed new blood vessels, alter and reverse the blood stream. More than that, the heart itself would be reconstructed, the valves realigned, and the coronary vessels perhaps rerouted or replaced. Indeed, he might envision the days ahead when a central organ would be transplanted in all its essentials. This anastomosis prospect is fascinating, and not too far distant is the restoration of a kidney or other organ with an accessible blood supply. Blood substitutes, animal or chemical, he would assert are sure to be discovered and processed into concentrated long lasting solid or usable potentials universally applicable. He would be vastly interested in tissue banks where skin, bone, blood vessels and other bodily components were available in sterile containers ready for immediate use. Interested as he always was in suture methods and materials, Halsted recognized that our method of coaptation was almost prehistoric and far behind the practices of prevailing reparative mechanisms. The ancients are said to have had a human glue that coapted even the eyelids or the inside of the cheek, and adequately brought together the huge wounds of the thigh so common among the pyramid builders. Indeed, open fractures of the femur for example in those days were very common, for we know traumatic surgery was one of the very earliest types of surgical endeavor. And adapting alien skin and bone for grafting purposes would be a laboratory enterprise sure to enthuse Halsted and enlist his active support. He would be interested also in the prospect of chemically dissolving calculi in the gall bladder and its ducts, and in the kidney, ureter and bladder. He would promptly and in perspective realize that infections of the appendix, the gall bladder, kidney, pelvic organs and elsewhere could often be controlled by nonoperative methods. And from a diagnostic standpoint, he would recognize the need for a universal electrically-operated portable device that would register certain abnormalities in subsurface organs. The heart and brain are thus responsive, and assuredly it should be possible to devise a mechanism that would reliably inform us regarding abnormal

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processes in the lung, stomach, liver, spleen and elsewhere.

—From "Halsted, The Surgeon's Preceptor," by JOHN J. MOORHEAD, in *Bulletin of the New York Academy of Medicine*, October, 1952.

From a Newspaper

THIS is from a newspaper, the *Washington, Pennsylvania, Observer*, September 23, 1952: "Industrial medicine is keeping pace with the changes and rapid advances in American industry. Half a century ago, the employment of industrial physicians was limited to companies engaged in hazardous activities such as mining, railroading and lumbering, and these were retained primarily to care for workers injured in accidents. Pioneer company doctors realized the inadequacy of medical services provided to workers, the lack of compensation, the poor working conditions, the unsanitary environments. Through their own efforts and with the aid of public-spirited laymen, the doctors were able to change the picture. As a result, preventive medicine, public health, sanitation, safety, health education, and workmen's compensation laws all

STATEMENT of the ownership, management, and circulation required by the Act of Congress of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233), of INDUSTRIAL MEDICINE AND SURGERY published monthly at Chicago, Ill. for October 1, 1952. 1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, A. D. Cloud, 1511 Hinman Ave., Evanston, Ill.; Editor, Carey P. McCord, M.D., Institute of Industrial Health, University Hospital, Ann Arbor, Michigan; Managing Editor, none; Business Manager, Stephen G. Halos, 5301 S.W. 76th St., Miami, Florida. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership, or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) Industrial Medicine Publishing Company, 605 N. Michigan Ave., Chicago, Ill.; Stephen G. Halos, 5301 S.W. 76th St., Miami, Florida; Harold A. Hooper, D.D.S., 7216 South Shore, Chicago, Ill.; A. D. Cloud, 1511 Hinman Ave., Evanston, Ill. 3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. 4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner. 5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.) A. D. Cloud, Publisher. Sworn to and subscribed before me this 1st day of October, 1952. (Seal) Lucille H. Gross. (My commission expires February 14, 1955.)

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have become a part, along with modern curative medicine, in what is known today as industrial medicine. Before America's industrial renaissance, England, France, Germany, and Italy had made great discoveries in the field of medicine which our physicians recognized and adapted to industrial medicine. Manufacturing carries with it many hazards to the health of workers, such as heat exhaustion, asphyxiation by gases, burns, injuries, lung disorders, and metallic and chemical poisoning. The physician engaged in an industrial plant recognizes the earliest symptoms of sickness, and is in this way enabled to prevent advanced cases of disease. Training in the recognition of early symptoms and familiarity with industrial hazards encountered have produced a new medical specialty in which preventive and curative medicine are joined—industrial medicine."

Conventions

THE meetings of scientific societies ostensibly take place to disseminate information. Researchers take the opportunity to talk about their problems at these meetings or, more formally, to deliver papers on their work. Visitors are moved to come to conventions for various reasons: to learn news, to renew contacts, to hear papers, or *to invite their souls to loaf*. Let one not underestimate the stimulus derived from such loafing. Probably one of the greatest gains derived from a convention is the insight gained from such productive loafing—and insight is one of the catalysts which transforms and correlates facts.

—From the *Monthly Bulletin of Di Cyan & Brown*, October, 1952.

Appointments

NEW staff appointments have been announced by the Division of Occupational Health, Public Health Service, coincident with the reorganization of the division July 1. The environmental investigations and clinical investigations branches have been merged into a single investigations branch at Cincinnati, to be headed by DR. W. CLARK COOPER, formerly Deputy Chief of Medical Services in the Public Health Service Hospital, San Francisco. DR. DALE C. CAMERON, previously chief of the cooperative health services branch, is now in charge of the new program developments branch of the division. MR. HENRY DOYLE, formerly in charge of the division's Salt Lake City field station, will direct the activities of the state aid branch. Both of these branches are located in the Washington office. DR. LEWIS J. CRALLEY has been assigned to direct the activities of the Salt Lake City field station. Prior to this assignment, DR. CRALLEY was chief of the environmental investigations branch in Cincinnati, Ohio.

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—*Chicago Tribune*, October 13, 1952.

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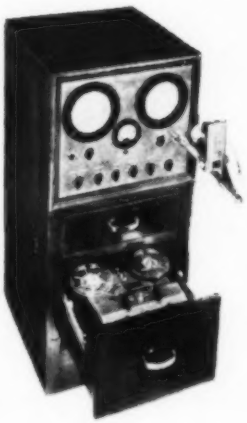

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